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No STRESS III

The flaws in the Bank of England's 2016 stress tests

Kevin Dowd



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Preface

No Stress III is the third report in the ‘No Stress’ series. This report focuses exclusively on the Bank of England’s 2016 stress tests of the resilience of the UK banking system. Like its predecessors, it suggests that the UK banking system is in much worse financial shape than the Bank of England suggests: the stress tests seek to demonstrate a resilience that simply isn’t there. The UK banking system is still highly vulnerable and another major shock could bring it down again.

In writing No Stress III I have benefited enormously from the feedback and other helpful inputs from many people who have generously shared their time and expertise, and I would like to thank them all most warmly: Anat Admati, Timothy Alexander, John Allison, Steve Baker, Mark Billings, David Blake, Roger Brown, Tim Bush, David Campbell, David Cronin, Jim Dorn, James Ferguson, Charles Goodhart, Martin Hutchinson, Gordon Kerr, Matthew Kilcoyne, Alasdair Macleod, Wande McCunn, Imad Moosa, Gerald O’Driscoll, Ben Southwood, Walker Todd, Sir John Vickers, and Basil Zafiriou. I would also like to thank a number of anonymous Bank of England officials for helpful discussions on some of the issues covered in this report.

Executive summary

- The Bank of England uses its stress tests to reassure the public that the UK banking system is safe. However, the Bank's reassurances lack credibility and are contradicted by the evidence.
- Rightly interpreted, the stress tests demonstrate the opposite of what the Bank claims they do: they demonstrate that UK banks are still financially weak and far from resilient. The UK banking system is an accident waiting to happen.
- The conclusion that UK banks are weak is confirmed by an analysis of their capital positions and is further confirmed by banks' market values being less than their book values. Low market values indicate problems with the banks that the stress tests did not pick up.
- The Bank made a number of mistakes in its stress tests. Among these: it relied on book values instead of market values, relied on unreliable metrics such as risk-weighted assets and Tier 1 capital, relied on a single stress scenario and used insufficiently demanding pass standards. The Bank's stress model also produced implausibly low projected losses and so failed a basic reality check.

- More generally, the stress tests are based on a series of imprudent judgments that led the Bank to miss obvious problems with UK banks.
- Regulatory stress testing is a highly imperfect tool with a track record of repeated failure in other countries, is compromised by conflicting objectives and by the Bank's poor forecasting record. It is also compromised by basic Public Choice economics, i.e., that public agencies act in accordance with their own interest.
- It also creates invisible systemic risks by pressuring banks to standardise their risk management practices to conform to the Bank's view of the risks they face.
- Far from providing a credible assurance that the banking system is safe, the stress tests are worse than useless because they provide false comfort, suggesting that the UK banking system is safe when it is clearly not. In this sense, the stress tests are like a ship's radar system that cannot detect an iceberg in plain view.
- The stress test programme is therefore dangerous and should be scrapped.

1. Introduction

On November 30th 2016, the Bank of England released the results of its third publicly disclosed set of stress tests of the financial resilience of the UK banking system.

It is important to appreciate why these stress tests matter: what is at stake is whether our banks are safe or not.

Now the Bank of England uses its stress tests to reassure us that our banking system is safe. If the Bank is correct, then we can conclude that it has successfully ‘fixed’ the banking system after the trauma of the Global Financial Crisis (GFC), but if the Bank is wrong, then the banking system is still not fixed and another major shock could bring it down again. Another major shock is only a matter of time.

I believe the Bank is wrong and evidently so: our banking system is an accident waiting to happen.

The 2016 stress test exercise was then entirely predictable: the Bank of England announced that the banking system was in good shape but its own test results and other evidence clearly suggested the opposite – same as with the earlier stress tests.

The spin that the Bank put on the results is that the banking system passes with flying colours even though one of the seven big banks involved failed (RBS) and two others (Barclays and Standard Chartered) were deemed to be problematic.

Let's pass over the slight contradiction at the heart of that narrative and quote Governor Carney:¹

“The resilience of the system during the past year in part reflects the consistent build-up of capital resources by banks since the global financial crisis. ... the UK banking system is well placed to provide credit to households and businesses during periods of severe stress.

“That conclusion is corroborated by the 2016 stress test [which is] broad, coherent and severe ...”²

1 Remember too that the 8th biggest bank, the Co-op Bank, was left out from the stress tests because you didn't need a stress test to demonstrate that it was a basket case. Thus, 4 of the biggest 8 banks are “officially” problematic – and, as we shall see, the others have their issues too.

2 Bank of England, “Opening remarks by the Governor.” Financial Stability Report Press Conference, 30 November 2016, p. 3. Available at <http://www.bankofengland.co.uk/publications/Documents/fsr/2016/fsrspnote301116.pdf>.

THE BANK'S STRESS SCENARIO AND ITS IMPACT ON UK BANKS

Every one of these claims is questionable, but let's focus on the severity of the Bank's adverse stress scenario, often hyped up in the press as its 'doomsday' scenario.

The latest stress scenario was about on a par with its predecessors, severe but hardly doomsday: there are a bunch of adverse events, including world and UK recessions (annual global GDP growth troughs at -1.9 percent and UK GDP falls by 4.3 percentage points), major falls (over 30 percent and over 40 percent) in the prices of houses and Commercial Real Estate (CRE), unemployment rising by 4.5 percentage points and sundry other stuff. However, the key phrase is this: "Overall, the UK stress is roughly equivalent to that experienced during the financial crisis, albeit with a shallower fall in domestic output ..."³

So the Bank's stress scenario was not quite as stressful as the Global Financial Crisis (GFC). Now consider how this adverse scenario impacts the banks. To quote Governor Carney, the adverse stress scenario led to "system-wide losses of £44 billion over the first two years of the stress – five times those incurred by the same banks over the two years at the height of the financial crisis."⁴

³ Bank of England, Stress testing the UK banking system, November 2016, p. 6.

⁴ Governor's remarks, p. 4. Strictly speaking, the £44 billion number is only the net loss, and it might have been more appropriate to have reported the gross loss (£63 billion) instead.

This statement misled some commentators into thinking that the stress scenario was five times more severe than the GFC, but it wasn't. Carney's statement implies that the system-wide losses over the two height years of the crisis were less than $\text{£}44 \text{ billion} / 5 = \text{£}8.8 \text{ billion}$.

One wonders how this statement is to be squared, say, with the BoE's own recent estimates that HBOS alone experienced losses of $\text{£}34.6 \text{ billion}$ in 2008-2009 and losses of $\text{£}52.6 \text{ billion}$ in the period 2008-2011.⁵ HBOS was not even among the big 4 banks. Among the big 4, RBS experienced a loss of $\text{£}40.7 \text{ billion}$ in 2008 alone and losses in excess of $\text{£}51 \text{ billion}$ over the period 2007-2010.^{6,7} Governor Carney's claim about the losses banks experienced in the crisis is wrong.⁸

In fact, the banks spread out their reported losses over the period since, because they were afraid of the adverse public reaction if they had disclosed them promptly and were concerned that revealing the true extent of their insolvency would have undermined their efforts to obtain

⁵ Bank of England, The failure of HBOS plc (HBOS): A report by the Financial Conduct Authority, (FCA), and the Prudential Regulation Authority (PRA), November 2015, Table 1.2.

⁶ Financial Services Authority, The failure of the Royal Bank of Scotland, December 2011, p. 38.

⁷ See UK and Irish Banks Capital Losses – Post Mortem, Local Authorities Pension Fund Forum, September 2011, p. 3.

⁸ For system-wide losses over the crisis, consider two different independent assessments: (a) The 2011 LAPFF study (op. cit.) suggests system-wide losses of over $\text{£}98.4 \text{ billion}$ over the period 2007-2010. (b) The Parliamentary Committee on Banking Standards ("An accident waiting to happen: the failure of HBOS", April 2013, p. 39) suggests system-wide losses of $\text{£}126 \text{ billion}$ over the period 2008-2011.

state bailouts. Consequently, the appropriate comparison is not with reported losses over these two years only but with cumulative losses post-2007. As James Ferguson of The MacroStrategy Partnership points out, the cumulative losses to date for the big 4 banks alone were about £440 billion.⁹

The system-wide £44 billion losses generated by the Bank's stress model are not five times the losses incurred at the height of the crisis but 44 divided by 440, or about a tenth of the losses banks experienced by the Big 4 since 2007.

But how can a supposedly severe stress scenario lead to the mild losses projected by the Bank's stress model?

The only plausible answer is that it can't: the link from the projected shocks to the projected losses is way too weak and the projected losses are way too low.

This point in and of itself is enough to *discredit the entire stress test exercise*.

To elaborate, recall that the scenario entails falls of 30+ percent and 40+ percent in the prices of houses and CRE. These are large falls to be sure, but the resulting net loss of £44 billion is a fairly small hit. With the big seven having almost £2.1 trillion in loan assets as of end-2016q3, a loss of £44 billion is equivalent to a loan loss rate of about 3 percent. This figure is, as Mr. Ferguson

⁹ J. Ferguson, "UK bank 'stress' test," The Macrostrategy Partnership, 2 December 2016, p. 2.

notes, “far shy of the ‘typical’ bank crisis loan loss rate of 10 percent, which is about what the banks have endured to date, during the resolution of the GFC.”¹⁰

As a further comparison, the BoE’s 3 percent projected loss rate is also well under the 4.1 percent projected loss rate from the European Banking Authority’s most recent (July 2016) stress tests, which few observers took seriously.

One then has to ask how such large falls in real estate prices could lead to such mild loss numbers. Consider the possibilities:

The first is that UK banks have relatively small positions in real estate, but we know that that is not the case.

The second is that UK banks have sizeable real estate positions but are well hedged against them, so a large fall in real estate will inflict relatively little damage. However, whilst it would be comforting to believe this explanation, it is implausible and there is no evidence to support it.¹¹

¹⁰ Ferguson, *op. cit.*, p. 3.

¹¹ To elaborate, a fairly small fall in real estate is not likely to inflict high losses on the banks because the initial losses are taken mainly by borrowers. As Mr. Ferguson points out in an email, bankers would suggest that even a 30 percent fall might have a small impact given existing Loan-to-Value ratios, but he goes on to point out that a fall of 40 percent might treble or quintuple their losses. There is therefore a close to knife-edge quality to banks’ exposure – and we know from European experience that large falls in real estate can inflict large losses on banks.

The only other possibility is that the Bank's model is wrong, because the adverse scenario should produce much greater projected losses than it does.

Yet in the Q&A at the press conference, Governor Carney makes a remarkable claim:

“the capital hit in this stress would have wiped out all of the capital that these same banks had prior to the crisis. So this is a big, big hit to capital.”¹²

This claim is also wrong and for two reasons:

1. For the big four banks alone, their 2006 Annual Reports report that their Tier 1 capital going into 2007 was about £116 billion. The projected £44 billion loss from the Bank's stress test model is only 38 percent of this number, and would be even lower if we included the capital of the other banks in the exercise.
2. In any case, a loss of £44 billion across the 7 biggest banks is not a “big, big hit”: it is, in fact, well under 1 percent of total assets.

THE FICTION OF THE 'GREAT CAPITAL REBUILD'

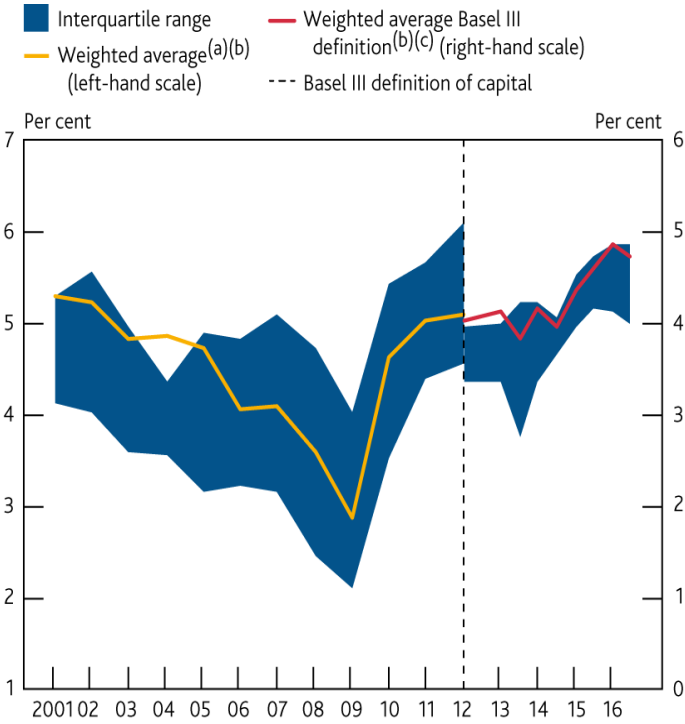
We should also consider the stress test in the context of the Bank's 'Great Capital Rebuild' narrative. To paraphrase Governor Carney's comments when the 2015

¹² Financial Stability Report Q&A, p. 19.

stress tests were released: the post-GFC period and the long march to higher capital are over. The message – which he has repeated since – is that UK banks are now more or less fully capitalised.

Let's look at the evidence. Exhibit A, on the following page, is the chart (Chart B.2) from the BoE's November 2016 Financial Stability Report.

Chart 1.1: Major UK Banks' Leverage Ratios



Sources: PRA regulatory returns, published accounts and Bank calculations.

Notes:

- (a) Prior to 2012, data are based on the simple leverage ratio defined as the ratio of shareholders' claims to total assets based on banks' published accounts (note a discontinuity due to introduction of IFRS accounting standards in 2005, which tends to reduce leverage ratios thereafter).
- (b) Weighted by total exposures.
- (c) The Basel III leverage ratio corresponds to aggregate peer group Tier 1 capital over aggregate leverage ratio exposure. Up to 2013, Tier 1 capital includes grandfathered capital instruments and the exposure measure is based on the Basel 2010 definition. From 2014 H1, Tier 1 capital excludes grandfathered capital instruments and the exposure measure is based on the Basel 2014 definition.

This chart shows some of the BoE's own estimates of UK banks' leverage ratios spanning 2001 to 2016: the leverage ratio is the ratio of some measure of capital to the total amount at risk. This chart indicates that UK banks' leverage ratios are a little higher than a decade ago – maybe 40% on this measure, but certainly no multiple – and a decade ago the banks were on the eve of an almighty crash.

Now comparing leverage ratios before the GFC and after is a tricky business because of definitional changes made by Basel III. Yet the Bank itself publishes figures for two leverage ratios known as Simple Leverage Ratios (SLRs): the ratio of shareholder equity to total assets. One refers to the book value of shareholder equity and the other to the market value of shareholder equity. These series give average SLRs across the banking system and span the period from before the GFC until recently.¹³ To the extent that we can rely on these to give us a before and after comparison, the average book value SLR was just under 4.1 percent in 2006 and 6.2 percent in the first half of 2016, representing an increase of 51 percent.¹⁴

The corresponding market value SLR was 8.0 percent going into 2006 and 5.28 percent in November 2015,

¹³ These figures will overstate the leverage ratio and understate true levels of leverage because they use the larger Shareholder Equity measure rather a narrow core capital measure such as Core Tier 1 or CET1, but they give some sense of the trends over time.

¹⁴ These figures are to be found on p. 57 of the Bank's November 2016 Financial Stability Report.

representing a decrease of 34 percent.¹⁵ By this latter measure, UK banks are more highly leveraged now than they were going into the crisis.

I would suggest that it would be prudent to pay attention to these market value figures: the market values being less than book values is a signal that the market perceives problems with the book values.

Then consider that the big four banks' total Common Equity Tier 1 (CET1) capital was about £205 billion by the end of the third quarter 2016. This figure is barely £90 billion higher than the £116 billion Tier 1 capital that they had going into 2007, although one must acknowledge that this £90 billion difference does not allow for the considerable improvement in quality between Basel II Tier I capital and Basel III CET1.

The third quarter 2016 £205 billion CET1 number is a book value figure, however, and the corresponding market value of its CET1 capital was about £149 billion.

We should also assess these numbers against the sizes of the banks' balance sheets, and it is traditional to use Total Assets as such a measure. Given that their Total Assets were just under £5 trillion at the same date, their average CET1 leverage ratio (or ratio of CET1 capital to

¹⁵ These figures come from the BoE Excel workbook 'ccbdec15.xlsx, spreadsheet '9. Bank equity measures' under the C column, 'Market-based leverage ratio (%)'. This workbook was accessed on March 9th 2016 but appears to have been removed from the BoE website since the time I accessed and downloaded it.

total assets) was 4.1 percent if we go by book values and just under 3 percent if we go by market values.

By the first measure, UK banks are leveraged by a factor of 1 divided by 4 percent or 25: they have £25 in assets for every £1 in capital; and by the second measure, they are leveraged by a factor of over 33. These are high levels of leverage that leave the banks vulnerable to shocks – and high levels of leverage aka inadequate capital were a key factor contributing to the severity of the GFC.

Putting all this together, the evidence for a ‘Great Capital Rebuild’ is not there – especially if one pays attention to the market value numbers.

As a further confirmation, Chart B.3 in the Bank’s November 2016 Financial Stability Report states that “Most capital rebuilding to date has reflected falls in risk-weighted assets” – a delightful piece of duckspeak – and then gives a breakdown of this ‘rebuild’ in terms of its constituent components. The rebuild it is referring to is not quite what it might seem, however: it refers to the rebuild in the banks’ average ratio of CET1 capital to risk-weighted assets (RWA) relative to 2009. Now the CET1 ratio was 6.92 percent in 2009 and had risen to 12.61 percent by end-2015. That increase breaks down into 0.45 percentage points in new equity raised, 1.02 percentage points in retained earnings and 4.22 percentage points in reductions in risk-weighted assets. Therefore, only 1.47 percentage points of that increase in the capital ratio represents actual increases in capital; the rest, the 4.22 percentage points decrease in risk-weighted assets merely reflects the decrease in

the denominator. I would suggest that the chart should have stated “Most of the increase in the ratio of capital to RWAs to date has reflected falls in risk-weighted assets” but that doesn’t quite convey the same message. The increase in the capital ratio from 6.92 percent to 12.61 percent might seem impressive at first sight – an increase of 82 percent – but the actual capital rebuild was only from 6.92 percent to 8.39 percent, an increase of about 21 percent. That increase is book-value, too.

Once again, the ‘Great Capital Rebuild’ is not there in the data.

In this context, I should also comment on one of the Bank’s standard mantras in recent years, its ‘Ten Times’ story: that bank capital requirements are now 10 times or more than 10 times what they were before the Global Financial Crisis (GFC).

Here are some examples:

- “Capital requirements for banks are much higher ... In all, new capital requirements are at least seven times the pre-crisis standards for most banks. For globally systemic banks, they are more than ten times.” (Mark Carney, 2014)¹⁶
- “... the capital requirements of our largest banks are now ten times higher than before the crisis.” (Mark Carney, 2016)¹⁷

¹⁶ M. Carney, “The future of financial reform,” 17 November 2014, p. 4.

¹⁷ Public statement made on the morning of June 24th 2016 shortly after the result of the Brexit vote was announced.

- “Common equity requirements are seven times the pre-crisis standard for most banks. For global systemically important banks (G-SIBs), they are more than ten times higher.” (Mark Carney, 2016)¹⁸
- “The largest banks are required to have as much as ten times more of the highest quality capital than before the crisis ... (Mark Carney, 2017)¹⁹

This latter claim is particularly significant because Governor Carney is referring to the largest banks in the world and was writing in his capacity as chairman of the Financial Stability Board (i.e., as the world’s most senior financial regulator) to the leaders of the G20 countries. He could hardly have chosen a more conspicuous forum in which to make his point.

At first sight, these claims are very reassuring. After all, if bank capital requirements are now ten times greater than they were before the GFC, that must mean that our banks are now much more resilient, right?

Wrong.

¹⁸ M Carney, “Redeeming an unforgiving world,” 26 February 2016, p. 8.

¹⁹ M. Carney, Letter to G20 leaders, 3 July 2017, p. 1.

The evidence for Governor Carney's claims would appear to be the capital requirements in the following Table (Table B.2) from the Bank's July 2016 Financial Stability Report:

Table B.2 Capital requirements have increased significantly

Capital requirements of the largest UK banks^{(a)(b)}

	Requirement (per cent)
Basel II CT1 minimum	2
Basel II CT1 minimum <i>using Basel III definitions</i>	1
Basel III CET1 minimum	4.5
+ capital conservation buffer	2.5
+ systemic buffers	1.0–3.5
+ countercyclical capital buffer ^(c)	1
Basel III CET1 minimum with buffers	9.0–11.5

Notes to Table B.2:

(a) Expressed as a proportion of risk-weighted assets. An additional 1.5% of risk-weighted assets must be held in AT1 [Additional Tier 1 capital] as part of the Basel III Pillar 1 requirement. UK banks are also subject to Pillar 2A requirements.

(b) See Caruana, J. (2012) 'Building a resilient financial system', available at www.bis.org/speeches/sp120208.pdf.

(c) in a standard environment.

This Table indicates that the minimum Basel II core Tier 1 (CT1) capital requirement was 1 percent using Basel III definitions. The lines below show the additional requirements for the ratio of Common Equity Tier 1 (CET1) capital to Risk-Weighted Assets (RWAs), which sum to 9 to 11.5 percent depending on the settings for the systemic and countercyclical capital buffers. The systemic buffer is likely to have an impact of no more

than 0.5 percent of RWAs, however.²⁰ As for the countercyclical buffer, the Bank of England announced on June 27th that this buffer would be raised from 0 percent to 0.5 percent. Therefore the actual value of the ‘Basel III CET1 minimum with buffers’ term at the bottom of the table should be no more than 8 percent, but let’s call it 8 percent to be on the generous side.

One might then say that CET1 Pillar 1 capital requirements involving RWAs are currently 8 times their Basel II counterparts.²¹ One might also say that the system envisages the potential for CET1 ratio capital requirements to be 11.5 times their Basel II counterparts – and even higher if one takes account of higher systemic buffers or a higher countercyclical capital buffer or the Pillar 2A requirements mentioned in Note (a) of the Table.

At first sight, such an increase in capital requirements might appear impressive. But consider the starting base. Under Basel II, RWAs could be a hundred times bank capital. The average ratio of RWAs to total assets across the big 7 UK financial institutions is about 32 percent. Applying this ratio, total assets might have been $100 \div 32\% = 312.5$ times capital: banks could be leveraged by a

20 The situation is however quite complicated and I won’t attempt to summarise it here. Instead, I would refer the reader to J. Vickers “The Systemic Risk Buffer for UK Banks: A Response to the Bank of England’s Consultation Paper,” *Journal of Financial Regulation*, Volume 2, Number 2, pp. 264-282.

21 Strictly speaking, line 2 in the table refers to ‘Basel II Core Tier 1 minimum using Basel III definitions’, whereas the later lines refer to ‘Basel III CET1 minimum’, but it is reasonable to suppose that these two measures are similar if not the same. Otherwise, the table would not provide any meaningful comparison between Basel II and Basel III.

factor of well over 300 under the old rules. Given that UK bank CET1 ratio capital requirements are currently 8 times what they were before the crisis, current requirements would still allow banks to be leveraged by a factor of $312.5 \div 8 = 39.1$. This is a high level of leverage and high leverage was a major contributor to the severity of the crisis.

And I have not taken account of how UK banks could increase their leverage further by switching into assets with lower risk weights or by moving positions from their banking books to their trading books.

The bottom line is that a large *percentage* increase in capital requirements does not represent a large *absolute* increase in capital requirements if the base is low to start with.

And why was the base so low? Because Basel II imposed extremely low minimum capital requirements. Correctly interpreted, Governor Carney's '10 times' narrative (or to use the more accurate figure, an '8 times' narrative) does not imply that banks now face high capital requirements; it is, instead, a damning indictment of the inadequacy of Basel II.

One can also look at this issue another way. The capital ratios that matter are not those based on the highly unreliable RWA measure: the ratios that matter are the leverage ratios. Basel II had no minimum required leverage ratio and Basel III introduced a minimum required leverage ratio of 3 percent. But this 3 percent minimum required leverage ratio is specified with Tier 1 capital as

the numerator and the leverage exposure as denominator. When one converts this leverage ratio into the ratio of CET1 to total assets using Basel rules and recent data for UK banks, the minimum ratio of CET1 to total assets is about 2.4 percent, allowing for a leverage factor of over 40.

Therefore, one can say that when it comes to the leverage ratio, the Basel III requirements are not 8 times or 10 times or even 20 times what they were: they are *infinitely* greater than what they were. Even so, they are *still too low*.

It is not for nothing that Martin Wolf has described Basel III as the mouse that did not roar.²²

Slinging around multiples of capital ratios is great fun, to be sure, but there is a more serious side too. The question one must ask is why does the Bank choose to emphasise this 10 times narrative to make their point that UK banks are now strong again, when the underlying facts on the ground – the leverage ratios especially – do not support that narrative. One might say the same about their stress test (fairy?) story too.

THE INADEQUACY OF THE INCURRED LOSS ACCOUNTING MODEL

Dr. Carney's responses in the Q&A also referred to another important issue that deserves attention: the

²² M. Wolf, "Basel: the mouse that did not roar," Financial Times, 10 September 2010.

inadequacy of the incurred loss accounting model under International Financial Reporting Standards (IFRS and in particular, IAS 39) by which losses are not recognised until they have been incurred and the inadequacy of the proposed solution to this problem, IFRS 9. The problem with the incurred loss model is that expected losses are not recognised at all.²³ The problem with IFRS 9 is that expected losses are recognised only if they are expected within 12 months. As he said in response to a question:

“Now there is another issue which is not adjusted for in the stress tests which is coming which is IFRS 9, which not yet finalised and could have some impact. But I think you know the banks, the analyst community, ourselves, we all have equal line of sight to that and its timing.”²⁴

So Governor Carney acknowledges that the Bank’s stress tests are based on accounting rules that ignore expected losses. This omission is a major source of concern, however, and must be one of the factors contributing to the low losses projected by the Bank’s stress test model: there will be expected losses coming through the system that the Bank’s model does not pick up at the point of supposed maximum stress.

His response indicates that the Bank believes that the implementation of IFRS 9 will not pose a major problem.

23 At least at a portfolio level: they can be recognized for individual assets.

24 Press conference Q&A, p. 18.

I disagree. To quote Tim Bush from his March 2017 evidence to the Treasury Committee Capital Enquiry:

IFRS 9 is not a full expected loss model. It differs from IAS 39 in two major respects:

- It books 12 months expected losses on all loans. That is clearly deficient if there are material expected losses in, e.g., years 2-5.
- When a trigger occurs IFRS then books all expected losses. That creates a “cliff edge” effect, i.e., all losses come in one go, whereas IAS 39 defers them.

In short, IFRS 9 is still booking losses too late. But when the losses are booked, they arrive in one go.²⁵

There is then the danger that the implementation of IFRS 9 starting in 2018 will lead to the partial revelation of expected losses coming through and will likely trigger a major shock as the skeletons in banks’ closets start noisily falling out: banks will be forced to make major write-downs that will highlight their capital inadequacy. At the same time, the implementation of IFRS 9 will create a gameable cliff edge, encouraging banks to engage in excessive forbearance on other loans that will delay loss recognition on those loans and make ultimate losses worse. Therefore some of the skeletons will fall out of the cupboard whilst those that can be will be pushed further to the back of it.

²⁵ “Written evidence submitted by Mr. Tim Bush (CAP0006),” published by the Treasury Committee Capital Enquiry, April 2017.

To make matters worse, this issue has to be seen in the context of the EU Commission actively seeking to undermine not just IFRS 9, but to roll back even the weak provisioning requirements of IAS 39, i.e., the Commission is seeking a solution that is worse than IAS 39's incurred loss model!

The explanation is that some banks have an issue with any accounting standards that require them to reveal the losses coming through: think of some big German bank that has a lot of legacy stuff from the GFC that it still hasn't sorted out. So this bank and others like it lobbied Brussels to ensure that IFRS 9 had even weaker provisioning requirements than IAS 39. The Commission was then captured by the banking lobby and its solution to the problem that tighter provisioning might cause a shock by revealing the true position is to weaken existing provisioning requirements to give banks even more scope to kick the can down the road. In fact, the situation is so bad that in March 2017 even the European Banking Authority could no longer stand aside without protesting about it.²⁶

There are also reasons to believe that IFRS 9 will cause major problems for future stress tests. A recent Barclays Equity Research Note suggested that a typical downturn under IFRS 9 could knock about 300 basis

²⁶ To quote the EBA: "as currently drafted, the Commission's response is not sufficiently prudent, as it may allow provisions that would exist under IAS 39 to be subject to the transitional arrangements and therefore added back to CET1." See "EBA publishes Opinion on transitional arrangements and credit risk adjustments due to the introduction of IFRS 9," European Banking Authority, March 6th 2017, p. 4.

points off the sector's CET1/RWA ratio, equivalent to over 100 basis points knocked off the leverage ratio.²⁷ If this estimate is anyway near correct, then a severe stress test properly carried out under properly implemented IFRS 9 would see a big hit to the stressed leverage ratio because of IFRS 9 – and this hit would come on top of the hit coming from the stress itself. If the Bank is relaxed about IFRS 9, it shouldn't be – unless it expects the Commission to succeed in neutering it.

THE SETTING OF THE COUNTERCYCLICAL CAPITAL BUFFER

There is one last issue that surfaced in the discussion that accompanied the release of the Bank stress test report: the setting of the Countercyclical Capital Buffer (CCyB). In March 2016 the FPC announced that the CCyB would be raised to 0.5 percent, but in July 2016, post the Brexit vote, the FPC announced that that increase would be cancelled before it had been implemented.²⁸ To quote Governor Carney again:

“The FPC was concerned that banks could respond to these developments by hoarding capital and restricting lending. The reduction of the CCyB rate was intended to reinforce the FPC's expectation that all elements of capital and liquidity buffers are able to be drawn on to support the real economy.

²⁷ See Barclays Equity Research, “IFRS 9- Bigger than Basel IV,” January 9th 2017.

²⁸ One might add that the earlier “increase” was mostly relabelling of existing capital, whereas the subsequent decrease was real.

“That position has not changed. In light of the continued uncertainty around the UK economic outlook and the resilience demonstrated in the 2016 stress test, the FPC agreed to maintain the CCyB rate at 0% and that it expects, absent any material change in the outlook, to maintain this rate until at least June 2017.”²⁹

I don’t understand this passage at all. First, banks do not ‘hoard’ capital: they issue it. To say that they hoard capital is buy into the ‘capital as a rainy day fund’ fallacy that has been debunked by Anat Admati and Martin Hellwig’s book, *The Bankers’ New Clothes* and in numerous articles elsewhere.³⁰ The same applies to statements that banks ‘hold’ or ‘have’ or are ‘required to have’ capital.³¹ The core of the fallacy is it mixes up the two sides of the balance sheet. A rainy day fund is an asset to a bank and belongs on the Total Assets side of its balance sheet, but bank capital is something that it issues and belongs on the Total Liabilities and Equity side of its balance sheet. Therefore the notion of a bank ‘hoarding’ (or ‘holding’ or ‘having’) capital

29 Governor’s opening remarks, pp.4-5.

30 See A. Admati and M. Hellwig, *The Bankers’ New Clothes: What’s wrong with Banking and What to Do about It*. Princeton, NJ: Princeton University Press 2013; or Admati and Hellwig, “The Parade of the Bankers’ New Clothes Continues: 31 Flawed Claims Debunked,” Stanford Graduate School of Business, December 2015. John Cochrane provides an entertaining demolition of this and related fallacies on his May 1st 2017 blog posting, “93 words, most of them wrong”, available at <http://johncochrane.blogspot.co.uk/2017/05/93-words-most-of-them-word.html>

31 See Dr. Carney’s statement from his G20 letter quoted on p. 10 above: “The largest banks are required to have as much as ten times more of the highest quality capital than before the crisis.”

makes no sense. Dr. Carney confuses what banks invest in with how they finance themselves. To quote his own colleagues: “It can be misleading to think of capital as ‘held’ or ‘set aside’ by banks; capital is not an asset. Rather it is a form of funding – one that can absorb losses that could otherwise threaten a bank’s solvency.”³²

In any case, how does relying on plain ‘continued uncertainty’ justify *any* CCyB decision, up or down, given that uncertainty, like the poor, will always be with us?

Carney also makes it clear that the Bank regarded risks as elevated, but then another problem emerges: if risks are elevated and the Bank responds by cutting its CCyB to zero, then the Bank has no room to reduce the CCyB further should those risks materialise. This latter point suggests that the FPC seems to have its countercyclical policy upside down. The purpose of the CCyB is to counter the cycle: as aggregate credit builds, markets boom and risks build up; then the boom breaks, markets

³² See M. Farag, D. Harland, and D. Nixon, “Bank capital and liquidity,” Bank of England Quarterly Bulletin, 2013 Q3, p. 201.

fall and risks fall.³³ The CCyB should rise in the first phase to help slow the euphoria as risks increase, and then fall in the second phase to ameliorate the pain when risks have fallen. Over the last few years markets have been booming, so we are presumably still in the phase where risks are building up. If so, then the FPC should increase the CCyB rather than reduce it. The FPC's 'countercyclical' policy is therefore procyclical: it is aggravating the problems it is meant to ameliorate!

At the very least, the Bank should always base its decisions on CCyB settings on a clear statement about which phase of the cycle they think we are in: Phase 1 implying that the decision to be considered is to raise the buffer to counter rising risks or Phase 2 implying the opposite. However, I suspect they don't do that because they don't know themselves or because they don't wish to expose their views to criticism: one can imagine the fun that critics would have. If I am correct, they would be better off abandoning CCyB policy altogether.

33 Consider this quote from a recent BIS document: "The countercyclical capital buffer aims to ensure that banking sector capital requirements take account of the macro-financial environment in which banks operate. Its primary objective is to use a buffer of capital to achieve the broader macroprudential goal of protecting the banking sector from periods of excess aggregate credit growth that have often been associated with the build-up of system-wide risk. Due to its countercyclical nature, the countercyclical capital buffer regime may also help to lean against the build-up phase of the credit cycle in the first place. In downturns, the regime should help to reduce the risk that the supply of credit will be constrained by regulatory capital requirements that could undermine the performance of the real economy and result in additional credit losses in the banking system." Bank for International Settlements (2016) "Countercyclical capital buffer." July 20. Available at <https://www.bis.org/bcbs/ccyb/>.

One gets the impression that all that they see is uncertainty, so they think “uncertainty is bad so we should ease” and reduce the buffer. However, if that is what they do, they are not even attempting to follow counter-cyclical policy at all: all they have is a policy bias towards ease, which is the same bias that we see with unconventional monetary policy for most of the past decade.

MARKET VALUES, ITN AND THE TREASURY COMMITTEE

A little over a month after the November 30th 2016 press conference, ITN’s Joel Hills approached me about a feature on the stress tests that he was planning to do for News at Ten. He was going to interview Sir John Vickers on the market vs. book issue and he asked me if I would provide the results that showed how using the latest available market values instead of book values would have affected the results of the Bank’s stress tests. Sir John and I had been arguing for some time that the Bank should pay much more attention to market values, especially when they are lower than book: as of early January 2017, average market values were about 2/3 of average book values on a size-adjusted basis.

Why should we use market values rather than book values? Because market values being less than book values signal that the markets do not believe the book values: they signal that there are expected losses coming through that the book values are not picking up.

The choice of book vs. market values also makes a big difference to the results of the stress test: if you use

book values in the Bank's stress test, then only RBS fails the test, but if you replace book values by market values and make no other changes to the test, then only Lloyds passes. So book vs. market values is a big deal.

The programme was aired on January 10th 2017. As it happened, the next day there was a meeting of the Treasury Committee who were interviewing senior officials from the Bank, including Governor Carney. The subject of the News at Ten report came up in the discussion and there was a robust exchange of views. The Bank witnesses wouldn't budge an inch, however: there was nothing wrong with their stress tests, market values are unreliable, they took account of them anyway, Sir John and I should have gone to them with our concerns, and so forth. (In fact, we had approached them with our concerns and our concerns had been dismissed.) They also confidently claimed that although they hadn't seen our spreadsheets, they knew that we had made a basic double-counting error and they would have put us right if we had approached them.

So not quite a meeting of minds.

It was eventually agreed that more work needed to be done to get to bottom of these issues, and Vickers and I were subsequently invited to meet with Bank officials, which we did. Regrettably, the details of these meetings are confidential.

KEY THEMES AND ORGANISATION OF NO STRESS III

In this third report in the ‘No Stress’ series I set out why I believe that Vickers and I are demonstrably right and the Bank of England is demonstrably wrong on the stress tests. In fact, both the stress tests and the Bank’s interpretation of their results are riddled with errors and misunderstandings, some serious.

My biggest concern is this: the stress test programme does far more harm than good, because it provides false risk comfort by suggesting that the banking system is resilient when it is clearly not. Put another way, the programme is pointless except as an exercise in providing false reassurance, which is to say that it is worse than useless when dangers are present or even might be present. Imagine a ship that was using a radar system that could not detect icebergs in plain sight.

I should also explain how No Stress III relates to its predecessors. The first, No Stress: the Flaws in the Bank of England’s Stress Testing Programme, was published by the Adam Smith Institute in the summer of 2015: it provided an overview of regulatory stress testing in the U.S. and Europe, and an analysis of the first (2014) UK stress test. A second edition, No Stress II: the Flaws in the Bank of England’s Stress Testing Programme, was published in August 2016: No Stress II was an update which covered the more recent European stress tests

and the 2015 UK stress tests.³⁴ This report, *No Stress III: the Flaws in the Bank of England's 2016 Stress Tests*, is not a third edition, however. Instead, it focuses on the 2016 UK stress tests and does not seek to update the earlier reports. Were I to attempt to do so, the report would merely get longer and longer and become ever more unwieldy.³⁵

No Stress III is organised as follows. Chapter Two examines the market values vs book values issue. Chapter Three explains the metrics of capital adequacy. Chapter Four sets out the basics of stress test methodology. Chapter Five sets out my analysis of the stress tests: it demonstrates that the Bank made a number of errors and concludes that, correctly interpreted, the results of the 2016 stress tests show that UK banks are still financially weak. Chapter Six deflates the Bank's January 11th evidence to the Treasury Committee. Chapter Seven looks at the fatal flaws of regulatory stress testing in general and Chapter Eight examines what should be done about the stress-testing programme – and my advice is to scrap it.

34 See K. Dowd, *No Stress II: The Flaws in the Bank of England's Stress Testing Programme*, Adam Smith Institute, London, August 3rd 2016, available at <https://static1.squarespace.com/static/56edde762cd9413e151ac92/t/579f53b66b8f5ba10895862b/1470059502224/No+Stress+II>.

35 Any reader who wishes for more information on regulatory stress testing might also consider looking at my *Math Gone Mad: Regulatory Risk Modeling* by the Federal Reserve, Cato Policy Analysis No. 754, Cato Institute, Washington D.C., September 2015, available at https://object.cato.org/sites/cato.org/files/pubs/pdf/pa754_1.pdf.

2. Market versus book values

“From the time of Abraham to 1938 in the USA and the traditions that preceded it, banks were supposed to keep their books using market-value accounting. The Finance textbooks say that market value is, after all, real value, while book is historic cost, which is not real value. In 1938, the Fed led an effort, blessed by FDR, to impose book value accounting on the banking system to enable the authorities to dispose of failed banks’ assets without triggering automatic markdowns throughout the rest of the banking system...

“Now here we are. Jamie Dimon argued in 2008 that his bank (and probably Goldman Sachs and Wells Fargo), did NOT need the capital provided by TARP. My argument is that, using market value accounting, they all needed the capital, even JP Morgan, Chase, Goldman and Wells.

“It’s a tough fight, but I think market value is worth defending.”³⁶

Walker Todd

36 Personal correspondence.

MARKET VERSUS BOOK: WHICH IS BETTER?

Book values are those reported for accounting purposes in banks' annual reports and interim financial statements. Market values are those given or implied in market prices, e.g., stock prices. So which is better?

The truth is that there is no universally correct answer, but there should be a presumption in favour of market values especially when market values are lower than book values.

Suppose that a bank has an asset with a specified book value, e.g., a branch or a financial asset, and the bank wishes to sell that asset. In these circumstances, the book value is irrelevant and what matters is what it can get for the asset, i.e., the market value. Similarly, suppose a bank wishes to issue shares and to make the example concrete, suppose that the book value of the share is £1 but the market value is 50p. If the bank issues a new share, then it gets no more than 50p for it and the book value is irrelevant. More generally, when it comes to buying and selling an asset, the book value is irrelevant and it is the market value that matters

However, there are occasions where book values are more useful. For example, suppose a financial institution holds a AAA-rated bond that it intends to hold to maturity. The price of this bond will fluctuate from day to day in response in changes in interest rates, but as far as the financial institution is concerned, these short-term fluctuations are noise, as the stream of payments promised by the bond is (more or less) known, assuming

no big adverse credit shock. In such circumstances, it might make sense for the bank to value the bond using some accrual, i.e., book-value, method, and to ignore the market value – unless it might become necessary to consider selling the bond.

It is often also the case market values are to be preferred because they are more informative. From this perspective, one might go as far as to say that as a general though by no means universal rule, market values are more appropriate because market values reflect information not in the book values, such as the impact of news or market participants' perceptions of problems that are not reflected in the book values. Most financial economists would also agree with this claim. Whilst few now subscribe to the strong-form Efficient Markets Hypothesis (EMH) belief that share prices are *fully informative*, few subscribe to the polar opposite extreme and claim that share prices are *completely uninformative*.

These considerations undermine an objection sometimes made against the use of market values: namely, that a belief in the informativeness of market values presupposes a belief in strong-form EMH. This objection is a straw man, however. I share the scepticism about strong-form EMH myself, but it does not follow that market values or share prices must be totally uninformative. Weaker forms of EMH have merit.

A second (and valid) objection to market values is that there are circumstances in which market values – including bank share prices – can fluctuate excessively. Banks' market values were clearly too high in the run-up to the

GFC and they can undershoot in the heat of a crisis. For example, the UK merchant bank Hill Samuel experienced a period of excessively low share prices in the highly volatile environment after the Herstatt Bank failure in 1974. At one point, its market value fell to about a quarter of its par value before bouncing back.

Hill Samuel was a sound bank that was caught up in a storm, but it does not follow that any bank experiencing a low share price is another Hill Samuel. Some banks experience low share prices for good reason: because the market correctly perceives them to be at risk of insolvency. Think of Northern Rock in 2007, Citi and Dexia in 2008, and so on. In such cases, market prices correctly signalled problems ahead.

Sir John Vickers makes a similar point in his letter to Mark Carney of December 5th last year:

“... market-to-book ratios for some major UK banks are well below 1. That indicates market doubt about the accuracy of book measures. To the extent that such doubts are correct, stress tests based on book values are undermined.

“The Bank appears to take the view that low market-to-book ratios [for UK banks] are down to dimmed prospects of future profitability rather than problems with current asset books. But such a view is hard to sustain for banks with [price-to-book] ratios below 1. There is, at the very least, a serious possibility that low market-to-book ratios are signalling underlying problems with book values. This certainly cannot be

dismissed, especially when one is examining the ability of the system to bear stress – an exercise that calls for prudence.”¹

To me this statement is self-evidently correct, so I was surprised that in his reply letter Governor Carney sought to challenge it: he continued to defend the Bank’s earlier position that low market-to-book is due to low future profitability and dismissed Vickers’ concerns about the possibility that markets might be signaling deeper issues with the book values.

I also have to ask myself how the Bank of England can be so sure (and prudently so!) that its interpretation is correct and Vickers’ is not.

Governor Carney’s response does not address his concerns and in any case raises further issues. One problem is that dimmed future earnings prospects to some extent reflect the Bank’s own Zero Interest Rate Policy (ZIRP), which has the effect of making banks’ core business model unprofitable, because that model depends on the Net Interest Margin that ZIRP pulls down.

There is also another problem. As Tim Bush observed:

“there is a circularity in Dr. Carney’s reference to low future profitability being the drag down of price/book.

¹ “Supplementary market-based stress test results,” letter from Sir John Vickers to Governor Mark Carney, December 5th 2016.

“The counter argument is that low future profitability is merely the result of deferring losses to the future, by not writing down the existing book and/or

“‘Low future profitability’ implies banks will be knowingly writing sub-standard business going forwards, which is irrational. And if it were true, the Bank should stop it.

“I think the low future returns are the unwinding of currently overstated positions. Be it loans, be it derivatives.”²

Mr. Bush is correct. The problem is in large part due to IAS 39’s backward looking ‘incurred loss’ loan loss model. Markets will price the book down to its expected recovery value and hence IFRS is bound to cause a dislocation between the book and lower market expectations. By contrast, pre-IFRS accounting rules forbade by statute the carrying of loans at more than their recoverable amount. The IFRS system plays to management incentives to run with as little capital as possible. Even worse, it encourages management to hide losses, and hiding losses is false accounting and false accounting is a criminal offence.³ The banks should therefore book the losses now and get it over with – and the Bank of England should have a contingency plan to deal with the resulting shock to banks’ capital ratios. We have been waiting for nearly a decade for them to take the hit

² Action Fraud. <http://actionfraud.police.uk/fraud-protection/false-accounting-fraud>

³ Personal correspondence.

and their reluctance to do so is one of the reasons why the recovery from the recession has been so weak and protracted.

Vickers' (March 3rd 2017) response to Carney is, to my way of thinking, unanswerable:

“The regulation of banks is based on accounting measures of capital. A major source of risk to financial stability is that capital is mis-measured by the accounting standards used in regulation. In that case, bank regulation that allows high (e.g. 25 times) leverage relative to accounting (or ‘book’) measures of capital is more fragile than may appear.

“An instance of this point is that stress tests based on book values are themselves vulnerable to erroneous measurement of capital, because those measurements are their starting point. Furthermore, bank regulation nowadays counts convertible debt instruments such as CoCos as akin to equity capital, but the conditions in which they convert to common equity (or are written down) are also dependent on accounting measures of capital. In short, *a lot is riding on book values being reasonably accurate...*

“None of this is to say that markets necessarily value assets accurately. Rather, the point is that *low price-to-book ratios, especially when below one, signal a serious possibility that book values are inaccurate*, and hence that the basis for regulation (not just in stress tests) is open to question.”

Market values are not always reliable, but

when [market values] *are low, systematic attention should be paid to them, and transparently so.*⁴ (My italics)

LOW MARKET VALUATIONS IMPLY THAT BANKS ARE LESS RESILIENT

A third objection to the use of market values was put by the BoE in its March 2017 submission to the Treasury Committee’s capital enquiry:

“Low market valuations can reflect a number of things, all of which lead to weak expected profitability. But, crucially, different reasons for weak profitability can have quite different implications for a bank’s resilience. This is because they have different impacts on the value of the bank’s assets if it needed to sell them to pay for losses elsewhere in the business.”⁵

The Bank then illustrated this point by comparing two hypothetical banks with the same cash flows – one is efficient but has poor assets, the other is inefficient but has good assets, and could sell some if needs be.

4 J. Vickers, “Response to the Treasury Select Committee’s Capital Inquiry: Recovery and Resolution,” March 3rd 2017, pp. 7, 8 and 12.

5 Quoted from Sir John Vickers’ letter to Alex Brazier, April 26th 2017, copies of which are available on request from Sir John.

The Bank's argument is a distinction without a difference, however. Weak expected profitability – whatever the cause, whether hidden losses or poor business models – is a potentially serious financial stability issue and it's as basic as that. As Vickers then pointed out in his April 26th 2017 letter to Alex Brazier:

“A holder of the BoE view, if I may put it that way, can however respond by noting ... that the inefficient bank with good assets can sell some. If such a bank alone faced difficulties – so in the absence of systemic stress – this would be a reasonable answer.

“But it is harder to see how asset sales could be a satisfactory response in conditions of systemic stress, a typical feature of which is precisely the inability of banks to sell assets except at distressed prices. This is the well-known ‘fire sale’ problem...”

The gist of this problem is that a bank that suffers a large loss might be forced to reduce its asset holdings by selling assets at fire-sale prices. If other banks must revalue their assets at these temporarily low market values, then the first sale can set off a cascade of fire sales that inflicts losses on many institutions and thereby creates a systemic problem.

“This kind of risk, I suggest, should be central to thinking about financial stability, and to stress tests. Financial stability policy should take a prudent approach as a general matter. In particular, it should not place reliance on banks being able to sell assets in crises at good prices. While that might cope with

an idiosyncratic shock affecting one bank, it will not do in a systemic crisis. But systemic crisis risk is the principal risk that regulation should guard against. The prudent stress test question, then, is whether the bank can meet its obligations without resorting to asset sales. It is not whether it can do so on the assumption that assets can be sold at good prices.

“In sum, low market valuations imply less resilience even when the possibility of asset sales is allowed for. Tests of resilience that rely on resort to asset sales are flawed because, as experience shows, in a systemic crisis it may well be impossible to realise full value from asset sales.”

Mr. Bush also offers a powerful rebuttal of his own:

“Essentially, from the perspective of a shareholder providing capital, the BoE’s second example (good current balance sheet, poor future returns) is really an admission that a bank as a whole is one big impaired asset. Nothing resilient about that. Particularly, no incentive to refinance it if it incurs unexpected losses for example. New investment won’t achieve an appropriate return.”

The BoE’s line is a bit like saying British Leyland was resilient if the factories were brand new.⁶

⁶ Personal correspondence

MARKET VALUES AND THE FINANCIAL CRISIS

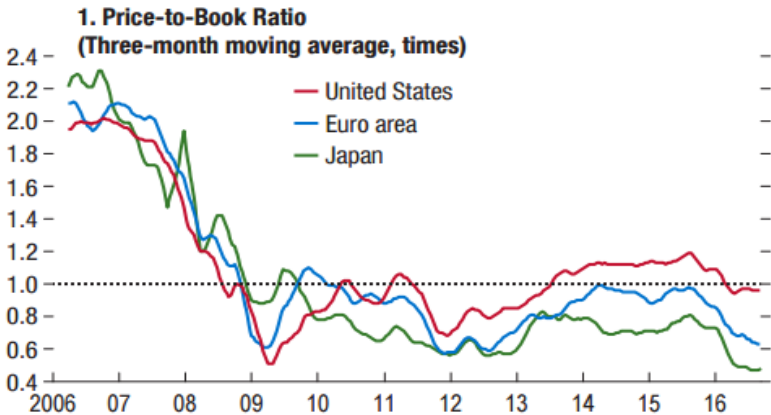
Another objection to the use of market values was made by Alex Brazier in his evidence to the Treasury Committee on January 11th 2017:

“...if you had [relied on market cap values] before the crisis, you would have been led completely astray ... You would have been led to the conclusion that the British banking system was remarkably resilient, and, as forecasting errors go, that would have been quite a good one.”⁷

Really? Consider the chart on the next page, which shows how the price-to-book (P2B) ratios of international banks fell before crisis. The P2B ratios for UK banks are similar.

⁷ Treasury Committee, “Oral evidence: Bank of England Financial Stability Reports,” HC 549, Wednesday 11 January 2017, answer to Q173.

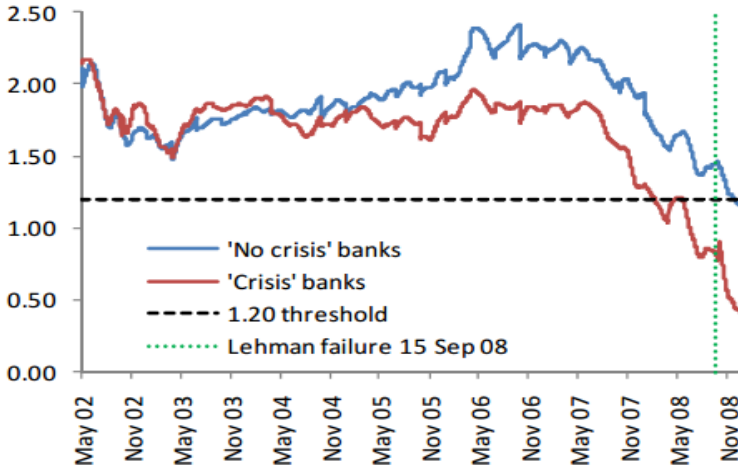
Chart 2.1:
Price-to-Book Ratios of Banks Internationally



Source: IMF Financial Stability Report, October 2016, Figure 1.11, panel 1.

Then consider the next chart, which shows the ratios of market capitalisation to the book value of equity for two sets of international banks, the “crisis” ones that failed, required assistance or were taken over in distressed conditions, and the “non-crisis” ones that weathered the storm.

Chart 2.2:
Market Capitalisation to Book-Value of Equity^{(a),(b)}



Source: Haldane, 2011, Chart 8.

Notes to Chart:

- (a) "Crisis" banks are a set of major financial institutions which in autumn 2008 either failed, required government capital or were taken over in distressed circumstances. These are RBS, HBOS, Lloyds TSB, Bradford & Bingley, Alliance & Leicester, Citigroup, Washington Mutual, Wachovia, Merrill Lynch, Freddie Mac, Fannie Mae, Goldman Sachs, ING Group, Dexia and Commerzbank. The chart shows an unweighted average for those institutions in the sample for which data are available on the given day.
- (b) The "no crisis" institutions are HSBC, Barclays, Wells Fargo, JP Morgan, Santander, BNP Paribas, Deutsche Bank, Cr dit Agricole, Soci t  G n rale, BBVA, Banco Popular, Banco Sabadell, Unicredit, Banca Popolare di Milano, Royal Bank of Canada, National Australia Bank, Commonwealth Bank of Australia and ANZ Banking Group. The chart shows an unweighted average for those banks in the sample for which data are available on the given day.

It is, thus, clear that markets were signalling problems with the banks and they correctly identified the weakest banks too. In the UK case, they also correctly identified in advance the two biggest UK problem banks, HBOS and RBS.⁸

Mr. Brazier omits to mention that the Bank was relying on Basel model-based book values that completely missed the impending meltdown and he does not offer any alternative that would have credibly worked better.

He also omits to mention the Bank's own record on this issue. The 'British banking system is resilient' is *exactly the message that the Bank itself was putting out* before the GFC. Not only did the Bank itself have no inkling of the GFC before it hit, but in the early stages of the GFC and even after the run on Northern Rock, it was still reassuring us that there was little to worry about and that the UK banking system was more than adequately capitalised. These reassurances proved to be as wrong as wrong can be.

As the previous two charts demonstrate, there is considerable evidence that market values did provide some warning and in any case performed better on this criterion than book values did. To quote from a careful analysis of this issue by the Bank's own chief economist, Andy Haldane:

⁸ See, e.g., Chart 2.73 on p. 153 of the FCA/PRA report *The Failure of HBOS plc*.

“Market-based measures of capital offered clear advance signals of impending distress. ... Replacing the book value of capital with its market value lowers errors by a half, often much more. Market values provide both fewer false positives and more reliable advance warnings of future banking distress.

“... market-based solvency metrics perform creditably against first principles: they appear to offer the potential for simple, timely and robust control of a complex financial web.”⁹

It is also helpful to compare their respective track records at predicting subsequently realised bank failures: markets have sometimes got it right and sometimes got it wrong, but bank regulators have *always* got it wrong. Their failure prediction rate is exactly zero percent. Even chicken entrails would have had a better success rate than whatever model or crystal ball regulators anywhere use to peer into the future and no rational person should ever believe the forecasts of a group of forecasters with a zero percent success rate.

The former President and CEO of BB&T Bank, John Allison, confirms this point and explains why:

“One observation in my 40-year career at BB&T: I don’t know a single time when federal regulators—primarily the FDIC—actually identified a significant bank failure in advance. Regulators are always the

⁹ A. G. Haldane, “Capital discipline,” speech given at the American Economic Association, Denver, January 9th 2011, p. 8.

last ones to the party after everybody in the market (the other bankers) know something is going on. ... regulators have a 100 percent failure rate. Indeed, in my experience, whenever they get involved with a bank that is struggling, they always make it worse—because they don't know how to run a bank.”¹⁰

But I digress.

So what it comes down to is that if the Bank does not use market values for the stress tests, then it should have a good reason not to. In terms of a concrete operating criterion, the natural answer is provided by the Principle of Prudence, which suggests that it should value using the lesser of book values and market values.

To rely on book values when market values are lower than book values is simply imprudent – and central bankers are famously prudent.

Whilst on the subject of prudence, wouldn't it be wise for the Bank to acknowledge at least the possibility that outsiders – not just Vickers and I, but also Anat Admati, Tim Bush, James Ferguson and Gordon Kerr, to name a few, and even Mervyn King, who has pointedly failed to endorse the stress tests – might be right or that we might at least have a point?

So answer me this, Bank of England: you say that your stress tests show that the UK banking system is sound.

¹⁰ J. Allison, “Market discipline beats regulatory discipline,” *Cato Journal*, 24(2), Spring-Summer 2014, p. 345.

But how can you be confident in such assertions, when your stress tests are based on book-value numbers and when the markets are clearly signalling that something is wrong with those book values?

To cut to the chase, how can you expect the public to believe your narrative when the markets don't?

THE VICKERS PROPOSAL FOR PARALLEL MARKET AND BOOK VALUE TESTS

So let me endorse Vickers' suggestion for a compromise, as set out in his December 5th letter to Governor Carney. If the tests are to continue the Bank should present both sets of results and let readers make up their own minds. As he wrote:

“[My] proposal is not that market-based tests for such banks should *replace* tests of the kind that the Bank has run. The request is merely that the Bank supplements its results with market-based results.

“That would inform public debate on a matter of great importance for economic policy, and it would enhance the transparency and accountability of the Bank.”

Yet the Bank still insists that it should not publish any such results because – to quote Governor Carney in his December 19th reply to Vickers' letter – to do so might confuse

“the Bank’s communication around its stress tests. If we publish two sets of results that give different messages, people might struggle to understand what we are trying to say about the resilience of the banking system.”

But as Vickers responded:

“A stress test is primarily a test of the resilience of the banks, not a communications exercise. Considerations of transparency and accountability should therefore far outweigh the regulator’s communications agenda.”¹¹

A bigger problem is that Carney takes the Bank’s credibility for granted and then focusses on making the message simple for the audience. Such reasoning puts the cart before the horse. Instead, the key to effective communication is credibility and credibility must be earned and maintained, not presumed.

The Bank does not help its own credibility by brushing aside good outside advice, however politely. Publishing market-based results could allay any possible concerns that it might be trying to window-dress the banking system and itself in the best possible light. The Bank would still be able to give its own commentary explaining why it thinks that the book-value results are more credible than the market-value results.

¹¹ Quoted in Vickers Capital Enquiry testimony.

It is also a mistake for the Bank to under-estimate its intended audience, who should be presumed to be capable of making up their own minds when presented with the evidence and be treated with appropriate respect.

The Bank repeatedly makes the mistake of ‘oversimplifying’ its message and then making claims that turn out later to have been way off the mark, thereby undermining its own credibility again and again. It made that mistake when it reassured us before the financial crisis that the banking system was strong. It made that mistake when it told us during the Brexit referendum that a Leave vote could trigger a recession and that Brexit was the biggest single risk facing the UK economy, and it is making the same mistake again with the stress tests.

To paraphrase Hubert Humphrey on propaganda, a perhaps not entirely unrelated subject: the Bank of England’s message, to be effective, must be believed. To be believed, it must be credible. At the moment, it is not.

3. Measuring Capital Adequacy

We measure capital adequacy by means of the ratio of core capital to the total exposure or amount ‘at risk’.

Let’s first consider the numerator in this ratio.

MEASURING CORE CAPITAL: ONLY THE BEST WILL DO

For capital adequacy purposes we want a measure of core capital, not total shareholder equity or the market capitalisation. By core capital, we mean the ‘fire-resistant’ (or loss-absorbing) capital available to support the bank in the heat of a crisis. There are a number of different core capital measures available, however, and some are more reliable than others. Their reliability is

in inverse proportion to their broadness: the broader the capital measure, the more ‘soft’ capital it includes and the less reliable it is. Why is this, you might ask? Because ‘soft’ capital instruments like Deferred Tax Assets (DTAs), intangibles and debt can’t absorb losses, which begs the question of why were they allowed into Basel II regulatory capital definitions in the first place. But, unfortunately, whilst it improves on Basel II in this respect, Basel III still allows certain softer capital instruments to be included in measures of core capital – and so, as we shall see, an important lesson from the financial crisis has still not been properly learned.

With any capital adequacy metrics, a major concern is cheating or ‘gaming’ to use the more polite language used in this area: bankers don’t ‘cheat’ except on LIBOR, they ‘game’. In the case of the capital measure, the concerns relate to bankers’ ability to exploit loopholes (e.g., by stuffing less expensive-to-issue softer capital items into the core capital measures approved by regulators) and with their lobbying to create such loopholes in the first place.

Tangible Common Equity

From a first principles perspective, the ideal core capital measure is Tangible Common Equity (TCE). The word ‘tangible’ implies that one deducts from market cap and/or book value intangibles (such as goodwill and DTAs) that cannot be deployed to help it in a solvency crisis. The acid test is this: if the bank were to fail tomorrow, what would the relevant capital instruments be worth? Goodwill and DTAs would be worth nothing.

The word ‘common’ implies that one deducts items like preferred shares and hybrid capital to which ordinary shares are subordinate.

The importance of TCE as the ultimate core capital measure was highlighted in a 2011 speech by former senior Federal Reserve official Daniel Tarullo. When reflecting on the experience of the GFC, Governor Tarullo observed that:

“...at least some of the instruments that qualified as “Tier 1 capital” [a core capital measure under Basel II] for regulatory purposes were not reliable buffers against losses, at least not on a going concern basis. It is instructive that *during the height of the crisis, counterparties and other market actors looked almost exclusively to the amount of tangible common equity* held by financial institutions in evaluating the creditworthiness and overall stability of those institutions [and essentially ignored any broader capital measures altogether].”¹² (My italics)

Common Equity Tier 1 (CET1) capital

Amongst the measures used by regulators, the narrowest and the least ‘polluted’ by softer capital instruments is Common Equity Tier 1 (CET1) capital. CET1 is equal to common shares plus realised earnings, accumulated other items and disclosed reserves and certain not too

¹² D. K. Tarullo, “The Evolution of Capital Regulation,” speech to the Clearing House Business Meeting and Conference, New York, November 9, 2011.

clear regulatory adjustments.¹³ But we should remember that even CET1 capital materially exaggerates the true common equity figure owing to the substantial portions of retained bank earnings attributable to mark-to-market derivatives ‘profits’; these latter are hoped-for profits that have not yet been realised.

Tier 1 capital

The Basel III regulations also specify a second somewhat broader core capital measure, Tier 1 capital. Tier 1 capital is equal to CET1 capital plus Additional Tier 1 (AT1) capital. Capital instruments are eligible to be classified as AT1 if they meet certain conditions, e.g., that they be issued and paid-in, be perpetual and be subordinate to depositors, general creditors and subordinated debt.¹⁴ In practice, the AT1 instruments that matter most are Contingent Convertible bonds, known as CoCos, that convert to equity under certain conditions. CoCo capital instruments ought not to be regarded as on any par with CET1:

- CoCos have not been tested in a major crisis.
- CoCos send out a distress signal that can aggravate a crisis, i.e., they may be of no use when needed most. For example, it would be difficult, to say

¹³ For a more complete definition of CET1 capital, see Basel Committee on Banking Supervision (BCBS) “Basel III: A global regulatory framework for more resilient banks and banking systems” (Basel Committee, June 2011), p. 13.

¹⁴ For more on the qualifying conditions for AT1 capital, see Basel Committee on Banking Supervision (BCBS) “Basel III: A global regulatory framework for more resilient banks and banking systems” (Basel Committee, June 2011), p. 15.

the least, for regulators to authorize the bail-in of a systemically important bank, for fear that doing so might itself trigger a systemic crisis.

- CoCos create the prospect of ‘death spirals’ and the danger that they might trigger or amplify a broader crisis as the CoCo market collapses. Once it became clear that triggers might soon be breached, investors would sell CoCos and possibly bank stock too.¹⁵ And once one bail-in occurs, there is a danger that investors will run from weaker banks, creating not just liquidity stress, but a broader crisis too.
- CoCos are procyclical and their use by regulators undermines their efforts to counter the cycle.¹⁶
- CoCos arguably displace the most advantageous form of recapitalization, which is new funds from existing shareholders. To rely on CoCo’s is to accept that a bank may not even be an attractive investment proposition for its existing shareholders.

Further doubts about their reliability arise from recent experience. In Italy, the adverse public reaction to regulators bailing-in CoCo investors in late 2015 has made authorities reluctant to do the same again, e.g., with MPS. In February last year, falls in the prices of Deutsche Bank’s CoCos triggered concerns that Deutsche might fail and cast doubt on the ability of CoCos to support a major systemic bank in a crisis. As a consequence, even ECB regulators have been having second thoughts

¹⁵ See also, e.g., Tracy Alloway, “An explanatory CoCo death spiral,” *Financial Times* Alphaville, March 8th 2011.

¹⁶ J. Zeng, “Contingent Capital Structure,” London School of Economics Working Paper, January 1st 2014.

about relying on them.¹⁷ And the CoCos' one supposed success story - the June 2017 bailing-in of CoCo investors in Banco Popular in Spain - suggests that, to the extent they helped at all, CoCos only worked as gone-concern loss-absorbency for a non-systemic bank. However, any measure of core capital is meant to be going concern capital that supports a bank before it fails

One might also ask who would be holding these instruments and how the discipline would operate. The banking system can hardly be recapitalized by banks holding each others' CoCos. Retail investors can be ruled out too: the Bank of England regards CoCos as so risky that it bans retail investors from holding them. Pension funds are another possibility, but they have to operate within risk tolerance limits that would sensibly preclude instruments as risky as CoCos and one can imagine the outcry if they were to suffer major losses on CoCos that were bailed-in. Then there are hedge funds and private equity groups with high risk tolerance, but it is difficult to see these as stable long-term investors. It is therefore difficult to see what social usefulness CoCos can serve.

¹⁷ M. Arnold and T. Hale, "ECB is having second thoughts on 'coco' bonds," *Financial Times*, April 24th 2016.

One other concern is that CoCos create the possibility of price manipulation and hence gaming around triggers. To quote Martin Taylor from the FPC: "I worry that CoCos may be subject to potentially destabilising manipulation by convertible arbitrageurs ..." See M. Taylor, "The fence and the pendulum," speech to the International Association of Credit Portfolio Managers, London May 22nd 2015, or S. Sundaresen and Z. Wang (2010) "On the design of contingent capital with market triggers," New York Fed Staff Report No. 448. However, such concerns are largely theoretical in Europe, because European CoCos must have book value triggers. I thank Wande McCunn for this clarification.

On the other hand, they would appear to be ideal vehicles for investors who wish to speculate on the view that, when push comes to shove in a major crisis, then central banks wouldn't dare bail-in investors who had bet against them.

Even the Bank itself has expressed doubts about Co-Cos. To quote Box 3 of its June 2014 Financial Stability Report, there are

“a number of issues concerning how this new and untested form of capital will work to mitigate risks to financial stability ...

“While AT1 can potentially increase CET1 of banks under a stress, a sharp market reaction following a trigger event, or as understanding of the features and risks of AT1 instruments evolve, could limit banks' ability to raise further capital and affect confidence in the banking system. It could also impose significant losses on holders of AT1 instruments, some of which may be systemically important. ... [W]ith only limited information on the investor base available at present, it remains difficult to assess precisely this risk for financial stability.”

As Vickers noted in his Capital Enquiry evidence:

“... even for AT1 capital, which regulation treats as akin to common equity, there are questions about investor understanding, market liquidity, the possibility of downward share price spirals (if the trigger were a market price), the credibility of conversion (if

the trigger is a regulatory value, as in fact) and the corresponding risk that regulatory values will be manipulated or relaxed (e.g. by delaying asset impairments or by reducing risk weights) to forestall conversion.

“Unless conversion is triggered well above levels at which resolution becomes an issue, the theoretical benefit of Cocos as going-concern capital could be evaporated. But the EU Capital Requirements Regulation requires a minimum trigger level of only 5.125% of CET1 capital in terms of RWAs. The PRA requires UK banks to have a minimum trigger level of 7% of CET1 capital, which is better but not a high figure, especially when the possibility of regulatory mis-measurement is allowed for.”¹⁸

Thus, CoCos are also unreliable because their triggers are very low and are based on questionable regulatory and accounting measures.

A leading expert in this field, Ayowande McCunn, informs me that the trigger probably needs to be at least 11% of CET1 to RWA for the CoCo to be a going concern instrument, the point being to recapitalize banks before they fail. If the trigger is too low, CoCos involve forbearance incentives that undermine this primary purpose. As he wrote in a recent working paper:

¹⁸ Capital Enquiry evidence, p. 4.

“CoCos were designed by regulators to absorb losses prior to resolution to create incentives for stakeholders to monitor. However, CoCo stakeholders have incentives to forbear (delay triggering CoCos). This incentive means that CoCos may be triggered as part of resolution (or other insolvency process) rather than being triggered in advance.

“In fact, if CoCos are triggered as part of resolution then they are unlikely to create incentives for stakeholders to monitor. As a consequence, it is difficult to justify the existence of CoCos as regulatory [core] capital. Accordingly, it might be argued that CoCos operate, in an economic sense, in a similar way to preference shares with tax deductible interest payments.”¹⁹

To quote former Bank Deputy Governor Andrew Bailey in his 2014 speech:

“The big lesson from this history [of innovative capital instruments being included in regulatory measures of core capital] is that a going concern capital instrument must *unambiguously* be able to absorb losses when the bank is a going concern. Apologies for stating the blindingly obvious, but history painfully demonstrates why it is important to state the obvious.”²⁰ (My italics)

¹⁹ A. McCunn, “Forbearance Incentives: Undermining the distinction between going and gone-concern capital” SSRN Working Paper, 5th April 2016.

²⁰ A. Bailey, “The capital adequacy of banks: today’s issues and what we have learned from the past,” speech to Bloomberg, London, 10 July 2014, p. 4.

Then there is the point that CoCos cannot be relied upon to work in a systemic crisis:

“Bail-in securities may make sense for an idiosyncratic bank failure—like the 1995 collapse of Baring Brothers, which was the result of a single rogue trader. But they do not make sense in the more common and intractable case where many banks get into trouble at roughly the same time as the assets they own go bad. On such occasions these securities, which may also have encouraged excessive lending, either will inappropriately shift the burden of bank resolution onto ordinary pensioners or, if held by others, will bring forward and spread a crisis. Either way they will probably end up costing taxpayers no less and maybe more. In this regard, fool’s gold is an apt description. ... Either we need real gold – more equity capital – or not. Fool’s gold is no alternative...

“Bail-in securities are not the silver bullet... they will likely make matters worse. If more gold plating of bank capital is what is required, then this fool’s gold will not do.”²¹ (Avinash Persaud)

This difference between real gold and iron pyrites is exactly the point: CoCo instruments are not of the same quality as CET1 and therefore Tier 1 capital should never be used as a measure of core capital.

21 A. Persaud, “Why bail-in securities are fool’s gold,” Peterson Institute for International Economics Policy Brief PB14-23, November 2014.

Finally, there is also a danger that the use of Tier 1 capital and hence dependence on CoCos will leave the financial system exposed to much the same problems as its dependence on hybrid instruments produced in the GFC.

To quote a speech by Bank Deputy Governor Sir Jon Cunliffe in 2014:

“The market in 2008 and 2009 clearly did not believe either the numbers for bank capital or for bank assets. Capital was not just pure equity. Tier 1 capital also included so-called ‘hybrid’ capital instruments – debt that was supposed to convert to equity to absorb losses. However, the ability of these instruments to absorb losses proved to be illusory. ...

“We have tightened up on the required quality of regulatory capital. The ‘hybrid’ debt instruments that proved not to be loss-absorbing no longer count as Tier 1 capital.”²²

He omits to point out that CoCos, which are allowed to account for up to a quarter of Tier 1 capital, are themselves a form of hybrid capital and share many of the features of the pre-GFC hybrids that melted down during the GFC when they were needed. It would imprudent, to say the least, to assume that we can rely on modern CoCos when their chocolate teapot antecedents didn’t work the last time.

²² Cunliffe, op. cit., p. 1.

And so we have a lot of good reasons why we should never use Tier 1 as a core capital measure.

MEASURING THE AMOUNT AT RISK

Then there is the denominator in the capital ratio, the total exposure or total amount ‘at risk’.

3.2.1 Risk weighted assets

The exposure measure long favoured is the so-called ‘Risk Weighted Assets’ (RWAs) measure. Indeed, we can even say that this principle of Risk-Weighted Assets was the key design feature of the Basel system from its inception with the original Basel Accord – now known as Basel I – in 1988. At first sight, it seems to make sense to have risk-adjusted capital requirements but in practice the adjustments create many more problems than they solve.

The way RWAs work is simple. Every asset is given an arbitrary fixed ‘risk weight’ that is usually between 0% and 100% but in unusual cases more. The ‘risk-weighted’ asset is then equal to the risk weight times the size of the position.²³

In the most egregious case, OECD government debt – including, at least until recently, Greek government debt – is assumed to be riskless and therefore attracts

23 If you think that these ‘risk weights’ have no relationship to any reasonable sense of the riskiness of these assets, you would be right: this methodology is unsound in principle, and people have pointed this problem out ever since ‘risk weights’ were invented.

a risk weight of zero; bank holdings of such debt then attract a zero capital requirement.²⁴ The debt of OECD governments would then be given a zero risk weight on the presumption that it is riskless whereas commercial debt would be given the full risk weight of 100%. Risk weights on mortgage loans were also very low. These zero or low risk weights encouraged banks to load up on such assets and were a key aggravating factor in the European banking crisis – a classic case of political expediency leading to predictable disaster.

The result is to create artificially low ‘Risk Weighted Asset’ measures that are much lower than total assets. To give an idea, the big 7 banks’ 2016 Annual Reports suggest that the average ratio of RWA to total assets for UK banks was a mere 31.8 percent, and one institution – the Nationwide – had a RWA to total assets ratio of just under 16.5 percent. So either these banks have indeed taken very low risks or they are just very good at playing the risk-weighting game, and the evidence suggests the latter.²⁵

24 I believe the zero risk-weighting of Greek government debt is now under revision by the Basel Committee, six years after the riskiness of Greek government debt exploded on the scene in 2011.

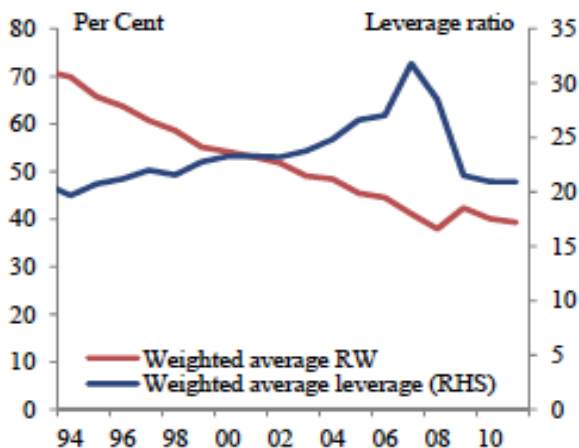
25 James Ferguson informs me that the risk weighting game is now crowded into mortgage risk weights, which across Europe tend to average around 11-12 percent, having been 25 percent pre-crisis and 35 percent in the standardised Basel III framework. Only large banks are allowed to use their Internal Ratings-Based (IRB) models to manipulate their risk weights in this way, however. Pre-crisis the banks had half their RWAs in mortgage assets, but have about two-thirds in mortgage assets now. They then use their IRB models to change their assumptions to make those assets as safe as they wish them to be. These considerations suggest that institutions such as Lloyds and the Nationwide could be highly exposed to a housing crisis. The fact that the stress tests largely missed this exposure is further confirmation of their inadequacy.

Such problems have been known about for a long time. It is then hardly surprising that, to quote Andy Haldane:

“Surveys of investors suggest a fairly deep-seated scepticism about risk weights, with only a small fraction regarding them as trustworthy ... From a low base, investor faith in these risk weights has continued to fall fast.”²⁶

He presents the following chart comparing RWAs with the simpler metric of bank risk, bank leverage or the ratio of bank assets to capital:

Figures 3.1: Average Risk Weights and Leverage



Source: The Banker and Bank calculations

(a) Sample consists of Deutsche Bank, HSBC, BNP Paribas, Barclays, Citigroup, UBS, BAML, BONY, Commerzbank, ING, JPM, LBG, RBS, Santander, State Street, UniCredit, Wells Fargo. Data are not available for the remaining G-SIBs.

(b) Leverage ratio is defined as Total assets / Tier 1 capital.

²⁶ See A. G. Haldane, “Constraining Discretion in Bank Regulation,” speech given at the Atlanta Fed conference, “Maintaining Financial Stability: Holding a Tiger by the Tail(s),” April 9, 2013), p. 11.

The shapes of the two plots are virtually mirror images of each other. In the period from 1993 up to the crisis, average risk weights fell from 70% to 40%, whilst average leverage rose from about 20 to well over 30. The leverage ratio picked up the growing riskiness of the banking system, but the average RWA was a contrarian indicator of banking risk. He then observed:

“In the pre-crisis boom, bank leverage rose steadily to reach historically unprecedented levels. This signalled high and rising bank risk. Indeed, bank leverage and bank risk weights moved in opposite directions over this period ... While the risk traffic lights were flashing bright red for leverage, for risk weights they were signalling ever-deeper green.

“The subsequent financial crisis has made clear which traffic light signal was at fault. The boom was leverage-fuelled and so too has been the subsequent bust.”²⁷

The explanation is that the lower risk weights do not reflect reduced riskiness, but instead reflect the increasing ability of bankers to game the risk-weighting system to hide the risks they were really taking. Thus, ironically, a lower risk weight usually translates into greater risk taking and we can reasonably conclude that the RWA measure is discredited.

There is the point that estimates of required capital to RWA ratios based on a boom period cannot give us

²⁷ Haldane, *op. cit.*, p. 10.

sensible expected loss numbers in a crash. To quote Mr. Ferguson:

“When calculating the required capital to risk weights, banks estimate both the probability of default and the expected loss given default. Since they use recent (non-crisis) history to ‘calculate’ these probabilities, the higher the leverage that drives the credit boom pre-crisis, the lower both the estimated probability of default (which is a function of recent default figures) and the expected loss given default because the LTV falls. However, we all know that the best (only) way to create a crash is to inflate a boom first, making this risk weight methodology truly insane.”²⁸

The RWA measure violates a basic principle of scientific methodology – namely, that measures of the things we measure should actually measure the things that we think they measure. Instead, RWA is a pretend number that bears no useful relationship to the risks actually taken. Reliance on this pretend RWA number then has the effect of artificially boosting capital ratios that use RWA in the denominator, thereby creating the appearance of capital that isn’t really there, i.e., fake capital.

The inadequacy of the RWA measure (and that of the Tier 1 capital measure too) was also demonstrated in the GFC. As Sir Jon Cunliffe observed in 2014:

²⁸ Personal correspondence

“In early 2009, around the height of the financial crisis, the market valued the combined equity of the major UK banks at less than 2% of their total assets. ... [Yet on] a risk weighted basis, the banks had 6.7% common equity capital – well above the 2% minimum. Tier 1 capital [to RWA] ratios were almost 9%.”

That is, banks were well capitalised according to the standard regulatory RWA metrics. To continue:

“This was of course the time when fear was at its peak. The message was crystal clear. When it mattered most, the market did not at all believe the published numbers for bank capital adequacy...

“This episode tells us two things. The first is that financial reporting matters. It matters at all times. But it matters most in times of stress...

“The second thing this episode shows us is that, when push came to shove, how little confidence investors had in the regulatory capital framework. In essence, markets discounted all types of capital except pure equity. And as they distrusted the risk-weighted numbers, they wrote down the value of the equity to reach the numbers I mentioned earlier.

“And, in many cases, they were right to do so. Capital adequacy turned out to be an illusion...

“When the crisis struck, not only did a significant portion of the assets turn out to be far riskier than estimated. Market confidence in the risk-weighted

capital adequacy framework as a whole pretty much evaporated.”²⁹ (My italics)

Part of the explanation for the failure of the RWA measure is that banks were loading up on assets with low RWAs to reduce their capital requirements. Going further, this RWA system is tailor-made for gaming: a bank loads up on low-weighted assets and is rewarded with a lower capital requirement because it is deemed to have low risk. In the limit, it could load up entirely on zero-weighted assets: it would then be deemed to have zero risk and incur a zero capital requirement.

The banks were gaming the system aggressively, too. Consider this quote from the FSA’s report into the failure of RBS:

“The capital regime was most deficient, moreover, in respect of the trading books of the banks, when required capital for many instruments was estimated using value-at-risk (VaR) approaches. The acquisition of ABN AMRO meant that RBS’s trading book assets almost doubled between end-2006 and end-2007. The low risk weights assigned to trading assets suggested that only £2.3bn of core tier 1 capital was held to cover potential trading losses which might result from assets carried at around £470bn on the firm’s balance sheet.”

²⁹ J. Cunliffe “The role of the leverage ratio and the need to monitor risks outside the regulated banking sector,” speech to the Financial Reporting Council annual conference, London, Thursday 17 July 2014, p. 1.

£2.3 billion divided by £470 billion is less than 0.5%:

In fact, in 2008, losses of £12.2bn arose in the credit trading area alone (a subset of total trading book assets).

Note too that the RBS's credit risk models would have given this £12.2 billion loss a probability of about zero: such losses were effectively impossible according to the models.

“A regime which inadequately evaluated trading book risks was, therefore, fundamental to RBS's failure. This inadequacy was particularly significant for RBS, given that the purchase of ABN AMRO significantly increased RBS's trading book assets. RBS was allowed by the existing regulations massively to increase its trading risk exposure counterbalanced only by a small increase in capital buffers available to absorb loss.”³⁰

When the higher Basel III capital standards were first announced in 2011, bankers' first instincts were to comply by gaming the system. To quote an article by Tom Braithwaite in the Financial Times:

“Jamie Dimon, JPMorgan's chief executive, said last week that he intended to “manage the hell out of RWA” to reach the higher levels. Morgan Stanley revealed that its risk-weighted assets had ballooned by \$44bn after the Fed said the bank was managing the hell out of its assets too much and told it to stop.

30 Quoted in Bailey, *op. cit.*, p. 5.

“A senior executive at a third bank told me that it was scouring its balance sheet, looking for assets that could be structured differently to achieve lower risk weights. ...

“A senior regulator tells me officials are fully expecting various nefarious schemes to circumvent the rules, including structured transactions that do not reduce their risk but do reduce their RWA.”³¹

Banks were (and still are) engaging in vast financial engineering transactions to move assets from high to low weight classifications in order to reduce their capital requirements. This game even has a name – Risk-Weight ‘Optimisation’ (RWO) – and RWO really means risk-weight minimisation. RWO was the main driving force behind the enormous growth in derivatives trading and securitization in the years running up to the GFC – and in so far as it led to (much) greater risk taking and (enormous) capital depletion, RWO was also a major contributing factor to the GFC as well.

A good example is the ‘how to destroy’ securitisation co-invented by Gordon Kerr in 2001. This little beauty used financial alchemy to game the Basel capital rules to transform a bog standard (big) bond portfolio held by a major UK financial institution into a (supposedly) almost risk-free credit derivative that warranted only one sixteenth of its previous capital requirement. Unfortunately, the risk reduction was only cosmetic and

31 T. Braithwaite, “Banks turn to financial alchemy in search for capital,” *Financial Times*, October 24 2011.

the bond portfolio remained as risky as it had been before. The transaction reduced the bank's required regulatory capital by fifteen sixteenths. This securitization was widely copied and Gordon was left wondering afterwards why it took so long for the banking system to fall over.³²

Thus, zero or low RWAs do not mean that the assets involved are actually zero or low risk; instead, they merely mean that Basel allows them to assign zero or low risk status to the positions so designated, which is an altogether different matter. Examples include not just Greek government debt but also carry-trade positions, which have zero risk weights, and many credit derivatives, securitizations and mortgaged-backed positions, which have very low risk weights. What these positions have in common is that they are all highly risky, but the Basel system operates to make those risks virtually invisible.

It was widely acknowledged that RWAs were flawed. The solution, it was claimed, was to make the capital requirements more risk-sensitive – and the way to do that was to allow banks with approved risk-modelling capabilities to use their risk models to help determine their capital requirements. This principle was first enshrined in the Market Risk Amendment to Basel I (1996): this Amendment allowed banks to use their risk models to help determine their capital requirements for their market risks. The use of risk models to

³² See G. Kerr, "How to destroy the British banking system – regulatory arbitrage via 'pig on pork' derivatives," The Cobden Centre, January 21, 2010.

help determine capital requirements for credit and operational risks was then the central feature of Basel II, which was rolled out to great fanfare in 2004. However, supplementing RWAs with risk models to determine capital requirements only made matters worse, as the risk models themselves are highly problematic:

- They are based on unreasonable assumptions (such as Gaussianity) and unreasonable risk measures (such as Value-at-Risk) that give enormous scope for creative traders and financial engineers to hide risks: traders can stuff risk into the VaR tails and so on.
- They are based on huge numbers of parameters, many of which cannot be estimated with any reasonable precision, and involve a great deal of model risk and just plain guesswork, all of which gives plenty of further scope for creative game-playing to drive the risk numbers down.
- They use probability of default (PD) and loss given default (LGD) models that are by their nature pro-cyclical and in practice impossible to calibrate properly.

- There is an abundance of evidence from recent empirical studies to suggest that simpler models outperform more complex ones.³³

At a deeper level, Basel II created a model monoculture in which everyone was trying to do the same thing – to model risks the same way to play the system – but what none of the risk models could measure were the risks created by all the banks acting as a herd of lemmings, which is exactly how they then behaved.

There is also a version of Goodhart's Law operating by which risk models break down when used for control purposes, i.e., no model can take account of the ways in which it will be gamed. This interaction between the risk managers, the models they use to control risks and the responses of those being controlled by these models means that markets are not mathematizable. Risk modelling is then just a game: the bankers pretend to model risks, but they are really gaming the risk numbers – and the regulators openly encourage them to do so.

33 These include: A. Demirgüç-Kunt, E. Detragiache, and O. Merrouche, "Bank Capital: Lessons from the Financial Crisis," World Bank Policy Research Working Paper Series No. 5473 (2010); D. G. Mayes and H. Stremmel, "The Effectiveness of Capital Adequacy Measures in Predicting Bank Distress," mimeo (2012); A. N. Berger and C. H. S. Bouwman, "How Does Capital Affect Bank Performance during Financial Crises?" *Journal of Financial Economics* 109 (2013): 146–76; A. Blundell-Wignall and C. Roulet, "Business Models of Banks, Leverage and the Distance-to-Default," *OECD Journal: Financial Market Trends* 2012, no. 2 (2014); T. L. Hogan, N. Meredith and X. Pan, "Evaluating Risk-Based Capital Regulation," *Mercatus Center Working Paper Series* No. 13-02 (2013); and V. V. Acharya and S. Steffen, "Falling short of expectation - stress testing the Eurozone banking system," *CEPS Policy Brief* No. 215, January 2014.

What then happened was that the banks hijacked the system and used it to ensure that their capital requirements became ever lower. The Basel system, which was meant to prop up banks' levels of capital, had become the means by which the banks were decapitalised by the bankers themselves. It was no coincidence that the financial crisis hit soon afterwards and much of the international banking system collapsed.

In short, the real (though seldom explicitly acknowledged) purpose of risk modelling is to use capital regulation to decapitalise the banks. The cybernetic POSIWID principle applies: the purpose of a system is what it does, not what some regulator says it does. When the banks later go bust, the bankers play dumb and lobby for a bailout; the banks then get recapitalised at public expense and the game repeats itself until the public eventually refuse to put up with it any more.

It is therefore no wonder that the models don't work: they were not intended to.

One could give many examples of the inadequate performance of risk models but three in particular are positively stunning:

- Calculations performed by the Bank of England showed that for the four biggest UK banks, cumulative trading losses over the height of the crisis were up to six times the value of the model-determined capital set aside to cover against such losses.³⁴

34 A. G. Haldane, "Capital Discipline," speech given to the American Economic Association, Denver, Colorado, January 9, 2011, chart 3.

- UK banks' reported losses – and these were primarily banking book losses – over 2007-2010 were over 183% of the banks' combined capital and reserves.³⁵
- In August 2007 Goldman's CFO David Viniar famously explained that their flagship GEO hedge fund was being bit by 25-standard deviation (or 25 sigma) moves, several days in a row. It was then being said that Goldman must have been unlucky, as a single 25 sigma event was a once in a 100, 000 year event. Unlucky is not the word, however. I sat down and did the calculations myself: the expected waiting time to observe a single 25 sigma daily event under the Gaussian distribution, the one normally used in finance, is 1.309×10^{135} years, i.e., about 1.3 with the decimal point moved 135 spaces to the left, a number that so vast that it dwarves cosmological numbers.³⁶ Therefore the Gaussian distribution, the most popular distribution used in risk management, is useless in the face of the big risks that matter. Risk managers should be banned from using it.

In each case, the risk models and resulting capital charges were signed off as compliant by regulators, but subsequent losses greatly exceeded the risk capital set aside to cover against them: the banks appeared to be capital adequate, but the model-based risk-weighted metrics merely disguised how weak the banks really were.

³⁵ LAPFF, 2011, p. 3.

³⁶ To put this number into perspective, the number of particles in the universe is believed to be no more than 10^{84} . See K. Dowd, J. Cotter, C. Humphrey and M. Woods, "How unlucky is 25-sigma?" *Journal of Portfolio Management*, Vol. 34, No. 4, (Summer 2008), pp. 76-80.

This RWA issue means that banks shouldn't be assessed by the ratio of core capital (however measured) to RWA. They should be assessed against a capital ratio that uses a much broader exposure measure that does not presume to predict or assign risk weights among asset classes, is more difficult to game and provides a more clear picture of a bank's ability to absorb loss regardless of source.

As a final PS on the RWA issue: whilst even regulators are now willing to concede that regulators were complicit in RWA games in the period up to the GFC, the fact is that they are still playing them themselves – or at least they were until November 2016. The reader will recall from Chapter 1 how the Bank's November 2016 Financial Stability Report tried to pass off the increase in the banks' CET1 ratio from 6.92 percent in 2009 to 12.61 percent in 2015 as capital rebuilding whilst simultaneously noting that almost three-quarters of this 'rebuilding' actually boosted the capital ratio by reducing the risk weighted assets in the denominator. An innocent reader could easily have formed the impression that the increase in the capital ratio from 6.92 percent to 12.61 percent reflected a substantial increase in actual capital.

Total assets

Traditionally, the total exposure was taken to be the total assets of the bank. This exposure measure worked fairly well when off-balance sheet items were fairly small and/or safe, and the accounting standards were

fairly reliable. In these circumstances TA is a good proxy for the most that the bank can lose. However, for many years now the on-balance-sheet amounts at risk have been overshadowed by the amounts at risk off the balance sheet in derivatives (such as Credit Default Swaps) and certain securitizations. These off-balance-sheet risks have long since made total assets highly inadequate as a measure of exposure, even leaving aside the fact that the TA is itself gameable.

Consider Barclays as an example – and I choose Barclays because none of the other banks' names begin with the letter 'A'.

Reported data for end-2016 from its 2016 Annual Report, indicates that the fair value of Barclays' total OTC (over the counter) derivatives liabilities for trading purposes was 25% of its reported total assets. However, these fair value numbers are based on a bunch of assumptions about hedge accounting and netting – many of which would unravel in a crisis. Any reasonable estimate of Barclays 'true' OTC derivatives exposure would then be higher than that. At the other extreme, the notional value of its OTC derivatives positions weighs in at 1,042% of total assets. This latter figure however will be a major over-estimate of the bank's OTC derivatives exposure as many notional amounts are close to meaningless as indicators of true exposure. So all we (think we) know is that the 'true' OTC exposure is somewhere between 25% and 1,042% of total assets, and there are the other off-balance-sheet exposures to consider as well. It is therefore safe to conclude that Barclays' true

exposures would be considerably greater than its total assets figure might lead us to believe.

The Leverage Exposure Measure

To help mitigate the problems associated with these earlier measures, the Basel III bank capital regulatory regime introduced a new measure of the amount at risk known as the 'leverage exposure'. This measure makes an attempt to incorporate some of the off-balance-sheet risks that do not appear in the total assets measure, whilst avoiding the problems associated with RWAs.

One problem is that large derivatives positions can remain excluded from the leverage exposure because of rules that allow them to be excluded if they are offset by other positions, the theory being that the net position is hedged. Unfortunately, some hedges are very poor and none is perfect: as we say in risk management, the only perfect hedge is in a Japanese garden. Hedges are imperfect for several reasons:

First, few if any hedge instruments are exact matches to the underlying position being hedged, which compensate exactly for losses on that position. Any ex ante assessment of the performance of a hedge instrument in an adverse scenario is dependent on a lot of assumptions, especially in very adverse scenarios (i.e., the ones that matter). There is always some slippage – known as basis risk – and some hedges involve a lot of basis risk. So even when a hedge might look good on paper, we often have little idea how well it would perform in a crisis.

To give an example, over the period 2005 to 2009, it transpired that Deutsche Bank had a large – at one point, a \$130 billion large – position in leveraged super senior trades, ‘super senior’ or quadruple A meaning theoretically safer than AAA bonds. The main risks in these positions were credit risks, but it transpired that the bank was hedging them with S&P put options, i.e., it was hedging credit risks with market risks. Such a hedging strategy involves an amateurish mistake on a grand scale: market and credit risks are quite different, and there was a very real danger that both the original position and its supposed hedges could take massive hits at the same time. Indeed, this seems to have been what happened. This gross-becomes-net outcome proved fatal for Lehman and may well have proven fatal for Deutsche too – had the bank allegedly not hidden the problem until (some of) the truth emerged in 2012.³⁷

Second, most hedges involve contracts with counterparties and therefore create an exposure to counterparty credit risk. As we saw with AIG, if a key counterparty fails, the netting breaks down and the gross position can become net with miserable consequences for the party relying on the hedge. Such problems could then create cascade effects. Suppose Bank A has some credit exposure to Bank B and institutes what appears to be a good hedging strategy to manage that exposure. Bank B, in turn, is exposed to Bank C, and institutes what appears to be a good hedging strategy to manage that exposure. Bank C then goes belly-up and Bank B experiences a

³⁷ T. Braithwaite, M. Mackenzie and K. Scammell, “Deutsche Bank: Show of strength or a fiction?” *Financial Times*, December 12, 2012.

gross-becomes-net disaster that is transmitted to Bank A, which was unaware of its indirect exposure to Bank C. Concerns about counterparty cascade effects were a key feature in the AIG fiasco.

Returning to the leverage exposure, we have all these problems plus the usual gap between theory and practice resulting from regulatory capture by the industry. In theory, the leverage exposure is meant to take account of off-balance sheet items that would not show up in traditional exposure measures such as total assets. However, the regulatory leverage exposure measure is a highly compromised measure that is the product of a lot of behind the scenes lobbying by banks keen to keep their measured exposures down in order to minimise their capital requirements. Given (a) that off-balance-sheet items can be large relative to on-balance-sheet ones and (b) that accounting netting rules tend to hide a great deal of financial risk, then we would expect any reasonable exposure measure to be considerably larger than reported total assets.

But they are not, at least not for UK banks. When I looked into this matter, I was astonished to discover that the leverage exposures of UK banks are not only of the same magnitude as their total assets, but are usually even lower. As of 2016q3, LE was lower than TA for four of the big five banks, and on average, LE was just under 94 percent of TA. Consequently, the leverage exposure measure that takes account of (some) off-balance sheet items is usually less than the total assets measure that does not take account of any of them. If you don't understand that, then your brain is working.

What seems to have happened is that the problems posed by hidden off-balance-sheet risks and inadequate RWA measures led to regulatory pressure to find a new denominator measure that could be used as a basis for additional capital requirements. This response started as a worthy effort to patch up some of the more glaring loopholes in the Basel system. However, the banking industry soon piled in to lobby against a broader denominator that would have increased their capital requirements – which was, of course, one of the objectives of the regulators in the first place.

Naturally, the banking lobby did not openly oppose the leverage exposure measure on the grounds that it would have led to higher capital requirements – that would have been too obvious. Instead, the banks emphasised level playing field issues – which are fundamentally irrelevant, but that is another story – relating primarily to the differences between US Generally Accepted Accounting Principles (GAAP) accounting standards and the IFRS accounting standards that apply in many countries outside the United States.³⁸ The key point here is that the latter produce notably higher asset values and lower capital ratios than the former, other things being equal.

This US GAAP vs. IFRS issue provided a useful smoke-screen to divert the reform discussion towards harmonisation for the purposes of agreeing how to measure the denominator in the new regulatory leverage ratio. The banks had hijacked the reform effort and the result

³⁸ For more, see, e.g., A. Admati and M. Hellwig, *op. cit.*, pp. 194–199.

was peddled as a solution to the off-balance-sheet problem when the reality was that it was not.

So why is the leverage exposure of similar or less magnitude to total assets under IFRS? The answer is that US GAAP allows much more generous netting arrangements than IFRS, so from an IFRS perspective, leverage exposure equals IFRS total assets + plus OBS add-ons + less generous netting, and these latter two offset each other. From the US GAAP perspective, leverage exposure equals US GAAP total assets + plus OBS add-ons + more generous netting, and so leverage exposure is somewhat, perhaps about 40 percent, higher than US GAAP total assets, and may or (probably) may not be a good measure of true exposure.

Well, you might say, at least the leverage exposure gets us away from the evil of RWAs. It does not even do that, however. Instead, it reintroduces them through the backdoor under a different name. The relevant Basel Committee document handles derivatives exposures by means of a system of ‘Credit Conversion Factors’, add-on factors that are arbitrary, low and frankly senseless.³⁹ For example, for standard interest-rate, FX, equities and commodity derivatives there are a series of add-on factors that vary from 0% to 15%, and for more exotic Total Return Swaps and Credit Default Swaps there are add-ons of 5% or 10%. The resulting numbers for OBS positions are low and bear no relationship to the true risk exposures. And so these add-ons reintroduce

³⁹ See Basel Committee, “Basel III leverage ratio framework and disclosure requirements,” January 2014, pp. 18-19.

the equivalent of new risk weights and take us back to the RWA problems that the broader exposure measures were supposed to escape from!

4. Stress-testing methodology

INTRODUCTION

The primary purpose of central bank stress testing is (supposedly) to assess the banking system's capital adequacy, i.e., to assess the ability of banks to withstand financial stress.^{40, 41} A stress test has three key components:

40 Since No Stress III is focused on the 2016 stress tests, this chapter gives a bare-essentials guide to understanding stress testing methodology. However, there is much more to be said on the deeper methodological weaknesses of regulatory stress tests. For more on these, see No Stress II, Chapter 3 or Chapter 7 below.

41 I emphasise that I am concerned in this study only with stress tests for bank solvency: stress tests for bank liquidity adequacy are another subject on which there is much to be said. An introduction to those stress tests is L. L. Ong and M. Cihák, "Of Runes and Sagas: Perspectives on Liquidity Stress Testing Using an Iceland Example," IMF Working Paper 10/156, July 2010.

1. An assumed adverse stress scenario – essentially a guess scenario generated by modellers at the central bank.
2. A metric to gauge the strength of each bank. This metric is the bank's capital ratio – the ratio of 'core' capital to some measure of the total amount 'at risk' – the intuition being that core capital provides a buffer to absorb potential losses and keep the bank solvent in a stress.
3. A pass standard by which to determine whether the post-stress value of the capital ratio is (or is not) high enough to merit a pass mark in the test.

There is a natural analogy with a school exam, the purpose of which is to assess a student's academic strength. It too has three key components:

1. There is an exam paper based on a set of questions and the underlying issue of how easy or tough the exam paper might be. The easiness/toughness of an exam paper is comparable to the severity or otherwise of the stress scenario.
2. There is the performance of the candidate in the exam, i.e., the grade they receive.
3. There is the pass standard, i.e., the minimum mark that a student must achieve in order to pass the exam.

One then draws one's conclusions. For example, if one had an easy set of questions, a low pass standard and a student who achieved a low mark, then one would conclude that the student was academically weak.

Similarly, if one had a stress test with a mild stress scenario, a low pass standard and generally low post-stress capital ratios then the test would prove that the banking system was financially weak.

Central bank stress tests also have a second objective – to promote public confidence in the banking system and, implicitly, to promote confidence in the central bank's policies towards the banking system. Indeed, this objective is stressed so frequently by central banks that one often gets the impression that the promotion of confidence is actually the primary objective.

But the question is whether that confidence is justified or not.

The problem is that these two objectives are often in conflict. If the banking system is weak then a bona fide stress test with a severe scenario and a rigorous pass standard should reveal that weakness. Unfortunately, revealing that weakness would undermine confidence in the banking system and undermine the second objective. In such circumstances, the only way to achieve the confidence-boosting objective is to water down the stress test exercise to engineer an undeserved pass result.

If the stress tests give the banking system a clean bill of health, the clash between these two objectives gives the central bank a credibility problem: it needs to persuade potential critics that the test really was demanding, and it needs to reassure them that it is not putting

its confidence-boosting objective ahead of the integrity of the test itself.

This credibility problem is *the* central issue with the stress tests.

This problem is heightened further by the fact that the central bank has a vested interest in the confidence-boosting objective: apart from anything else, for the central bank to suggest that the banking system was in poor shape would be to acknowledge that its own policies had failed.

However, it is sometimes still possible for an outside observer to make an informed judgment on the integrity of any stress test: the key is to look for evidence that the test is demanding. So if there is strong evidence that the adverse scenarios are genuinely severe and if there are a reasonable number of them, if the pass standards are high, if there are no obvious major biases or weaknesses, and so forth, one might incline to believe the results.

Conversely, one might not. A sure sign of a cheat is a stress test that emphasises harsh macro assumptions but does nothing to ensure that these harsh assumptions make it through to the micro level projected loss rates. The stress testers at the EBA and ECB are very good at this.

We now consider some of the key methodological issues in stress testing.

THE STRESS SCENARIOS

Let's start with the selection of stress scenarios. A stress scenario is a hypothetical adverse event – essentially, it is a model-based guess of what might happen in the future.

The first question that then arises is how severely adverse should a stress-scenario be? There are no hard and fast rules here, but one needs a scenario that is seriously severe but not off-the-chart severe. If a scenario is too mild, then the usual stress test result – that the banks pass the stress test – is of no use beyond an attempt at propaganda. A stress test based on a mild scenario is like an exam with a very easy set of questions: it tells us nothing useful because even a poor candidate will pass. At the other extreme, an impossibly severe scenario is of no use either. The corresponding exam analogy also applies: an exam with an impossibly demanding set of questions tells us nothing useful because even the best candidate will fail.

Then there is the question of the type of scenario to use in a stress test. Again, there are no hard and fast rules, but one is looking for plausible 'what if' adverse events. These could be based on suspected vulnerabilities: if one suspects that a bank is heavily exposed to, say, real estate, then one might use stress tests that attempt to gauge the bank's ability to withstand a severe real-estate downturn. One can also select scenarios based on hypothetical repeats of historical experiences or contemporary experiences overseas. Most obviously, one might compare the severity of a scenario with the 1930s, the

East Asia crisis, the GFC or the recent experience of the Eurozone. Some obvious contemporary risk scenarios that might form the basis of stress test scenarios are the possibilities of a renewed Eurozone banking crisis, a major banking crisis in China or a decent rerun of the GFC.

There is also the question of how many scenarios to run. Since the future is uncertain, one wants a range of substantially different scenarios that one hopes might approximate the main risks that banks face as best one can perceive them. However, there is no magic formula to tell us how many scenarios to consider, i.e., one has to make a judgment about how many to use.

There is however one hard and fast rule: both the risk management literature and even common sense suggest that at the very least one should not rely on a single adverse scenario.⁴² The chances of any particular scenario coming to pass are very small, and it is highly likely that one will get an outcome quite different to that envisaged.

So even if one conducts an otherwise flawless stress test that shows that the banking system is safe under the scenario considered, one cannot possibly know whether the banking system will be safe under all the other plausible scenarios that were not considered. This is so because:

⁴² For more on the state of the art in financial stress testing, see, e.g., "Stress testing", pp. 291-307 in K. Dowd, *Measuring Market Risk*, 2nd edition, Chichester: Wiley, 2005 or D. Rösch and H. Scheule (eds) *Stress Testing for Financial Institutions*, London: RiskBooks, 2008.

- The impact of any scenario on a bank depends on the extent to which the scenario captures that bank's particular vulnerabilities – banks have different business models and different sectoral and geographical footprints.
- If one relies on just one scenario one could easily have a situation where a weak bank performs well in a stress test only because the scenario misses its main risk exposures. It is precisely to reduce this danger that the stress testing literature advises that, if one is to do stress testing at all, one should rely on multiple and substantially different scenarios in the hope that if a bank has a major vulnerability, then at least one of the scenario analyses will flag it.

No single scenario can ever give you confidence that the banking system is safe. A recent article put this point much better than I could:

“A key principle underlying the Bank's approach to stress testing is to explore a range of scenarios. Any single scenario is almost certain not to materialise. And it is not desirable from a regulatory perspective that the banking system as a whole is only assessed against a single ‘bad state of the world’. Moreover, from a practical perspective, differences in banks' business models imply that scenarios that might be stressful for one bank might be much less so for another. To make the framework useful for policymakers, stress tests should explore different

vulnerabilities and manifestations of possible future stresses.”

And where does this admirable advice come from? It comes from the Bank of England’s own ‘framework’ paper on the stress tests!⁴³

Image your doctor is giving you a health check-up: they wouldn’t run a test for bowel cancer, say, and then use a negative result to conclude that you were free of heart disease, let alone of anything else that you might have as well. If your doctor did that, they would be struck off. No one medical test can reassure you that you are in perfect health, and yet this is what the Bank of England is trying to do with its stress tests: it is trying to use one test (and an unconvincing one at that!) to demonstrate that the banking system is in robust good health. It just can’t be done.

To repeat: we cannot draw general inferences about the robustness of the banking system to a range of possible future shocks from any exercise based on a single hypothetical scenario.

In stress testing, what is important is to model a range of different scenarios in a simple broad-brush manner, not to fine-tune any one scenario whilst ignoring other scenarios entirely. To quote risk expert Christopher Finger:

⁴³ See Bank of England, “A framework for stress testing the UK banking system,” October 2013, p. 19.

“...we do not look at any single scenario carefully, but rather hope that the set of scenarios covers the spectrum of risks we might face.”⁴⁴

One might even say that this is the first fundamental principle of good stress testing.

The stress scenarios are way too orderly in that they do not capture key features of real-world financial crises. They understate the fat tails and nonlinearities, they do not capture the adverse feedback and amplification effects, or the chaos, confusion, funding and fire-sale problems. As well as underestimating the impact of real sector effects on the financial sector, they also underestimate the impact of financial sector effects on the real sector, and above all, they underestimate the opaque interconnectedness of the system. To quote Anat Admati:

“It is impossible to predict with any precision how an actual crisis, which may come from an unexpected direction, would play out in the highly interconnected system. The opacity of the system and the existence of many layers of intermediation make it difficult to assess true counterparty risk and the correlation between underlying macro risk and counterparty risk. Risks that are assumed to be transferred

⁴⁴ C. C. Finger, “Epilogue – Fishing for complements”, p. 444 in D. Rösch and H. Scheule (eds) *Stress Testing for Financial Institutions*, London: RiskBooks, 2008.

and dispersed may instead be concentrated elsewhere, as happened in the case of AIG.⁴⁵

These factors make financial crises much more costly than normal recessions and the stress tests greatly understate them.⁴⁶ Morris Goldstein provides a neat example:

“(a) Note that when former Federal Reserve Chairman Ben Bernanke testified to Congress in 2007 about the subprime crisis, he estimated that it would generate total losses in the neighborhood of \$50 billion to \$100 billion ... (b) But ... when Bernanke gave testimony in an AIG court case ... he explained that, by September and October of 2008, 12 of 13 of the most important financial institutions in the United States were at risk of failure within a period of a week or two. The question for stress test architects and modelmakers is, How do you make your models generate a transition from (a) to (b) in the course of, say, a year or two? This is not a technical sideshow. In stress modeling, it is the main event.”⁴⁷

⁴⁵ A. R. Admati, “The missed opportunity and challenge of capital regulation,” National Institute Economic Review Number 235, February 2016, pp. R4-R14.

⁴⁶ M. Goldstein, *Banking’s Final Exam: Stress testing and bank-capital reform*: Washington DC: Petersen Institute for International Economics, May 2017.

⁴⁷ Op. cit., p. 251.

THE PASS STANDARD

Turning now to the pass standard, the first point to appreciate is that the Bank does not regard its hurdle rate or its new Systemic Reference Points (SRP) as pass standards in a strict sense. The Bank always makes a point of saying that the result of the test is not some automated pass/fail exercise based purely on how the post-stress leverage ratio compares to the hurdle rate or SRP: the Financial Policy Committee gives due consideration to other factors. However, in practice so far, the FPC has always operated ‘as if’ the exercise were an automatic pass/fail one based purely on how that leverage ratio compares to the hurdle rate, and so for present purposes we may treat the exercise ‘as if’ it were this way and skip the subjective judgement step. In any case, I am not able to second guess those judgements as I am not privy to whatever other information they used or how they interpreted it.

The 2016 stress test involves two sets of pass standards, if I may use that term here. The first is the hurdle rate, and the second is the Systemic Reference Point which applies to banks deemed to be systemically risky. The SRP in turn is equal to the hurdle rate and phase-in value of such a bank’s G-SIB (or Globally Systemically Important Bank) buffer which will generally rise over time until the G-SIB buffer is fully phased-in.

There are then the hurdle rate and SRPs for the CET1/RWA capital ratio and those for the Tier 1 leverage ratio which are suitably scaled down.

The pass standards for the CET1 ratio

The average hurdle rate for the CET1 ratio is 6.5 percent, and the corresponding average SRPs rise from 6.9 percent in 2016 to 7.8 percent in 2020. My first observation here is that these new pass standards are a considerable improvement over the 2015 stress test which had a single low hurdle rate of 4.5 percent.

However, the impact of these changes, welcome as they are, is mitigated by the consideration emphasised in the previous chapter that the CET/RWA metric is highly flawed due to its reliance on the useless if not worse than useless RWA measure.

The pass standards for the Tier 1 leverage ratio

The hurdle rate for the Tier 1 leverage ratio is still 3 percent, as it was in the 2015 test. However, the average leverage ratio SRP rises from 3.1 percent in 2016 to 3.4 percent in 2020, and is 3.3 percent at the peak of the stress in 2017.

We can assess these pass standards both against better regulatory practice overseas and against first principles.

The pass standards for the Tier 1 leverage ratio viewed against better regulatory practice overseas

The 3 percent Tier 1 minimum capital requirement original comes from Basel III imported into the UK. However, even with the G-SIB add-ons, this standard is

still low compared against better practice overseas, i.e., in the United States:

- The Federal Reserve has been enforcing a minimum required Tier 1 to (un-risk-weighted) assets leverage ratio of 4% on all U.S. banks since 2014, and this 4% requirement is one of the pass standards used in its Comprehensive Capital Analysis and Review (CCAR) stress tests.⁴⁸
- Banks there have to meet a 5% minimum leverage ratio to be regarded as ‘well-capitalised’ under the Prompt Corrective Action (PCA) framework – and a bank with a leverage ratio of 2% or less is regarded as so badly capitalised that it should be put into receivership.
- The Federal Reserve is in the process of imposing a 5% minimum leverage ratio requirement on the 8 US G-SIB bank holding companies and a 6% minimum leverage ratio on their federally insured subsidiaries effective on 1 January 2018.⁴⁹

48 See Board of Governors of the Federal Reserve System, “Comprehensive Capital Analysis and Review 2014: Assessment Framework and Results,” pp. 8-9.

49 See Board of Governors of the Federal Reserve System, “Agencies Adopt Enhanced Supplementary Leverage Ratio Final Rule and Issue Supplementary Leverage Ratio Notice of Proposed Rulemaking.” Press release, April 8 2014.

The leverage ratio pass standard viewed against first principles

Let's step back for moment. It is generally acknowledged that high bank leverage was a key factor contributing to severity of the GFC. For the UK, Bank of England data suggest that UK banks' average simple leverage was 27.8 in 2007.

Basel III then sought to counter high leverage by imposing a minimum required leverage ratio on regulated banks.⁵⁰

So how onerous are Basel III's constraints on bank leverage? More precisely, what is the maximum permitted leverage under Basel III?

A clear expression of the Basel rules on this point is the following from the 2015 Prudential Regulatory Authority (PRA) Rulebook in the UK:

3 MINIMUM LEVERAGE RATIO

3.1 A firm must hold sufficient tier 1 capital to maintain, at all times, a minimum leverage ratio of 3%.

50 Critics however have argued that such requirements are onerous. These include many leading bankers (e.g., Jamie Dimon and former Deutsche Bank chairman Josef Ackermann) and even central bankers (e.g., Alan Greenspan), the American Bankers Association, and the British Bankers Association (see, e.g., the citations in A. Admati, A. and M. Hellwig, 2013).

3.2 For the purposes of complying with 3.1, at least 75% of the firm's tier 1 capital must consist of common equity tier 1 capital.⁵¹

As an aside, it is disappointing to see that the PRA's own rulebook explicitly endorses the 'capital is a rainy day fund' fallacy by stating that banks "hold" capital. This is the same mistake that Governor Carney made in the November 30 2016 press conference when he referred to banks "hoarding" capital. To repeat: banks do not "hold" or "hoard" capital. To suggest that they do so is to suggest that capital is an asset to a bank. It is not. Read Admati and Hellwig.

This minimum required leverage ratio is expressed in terms of the ratio of Tier 1 capital to the leverage exposure. Section 3.1 of the PRA Rulebook would suggest that the maximum permitted leverage is then $1/3$ percent = 33.33.

Section 3.2 of the PRA Rulebook then states that at least 75 percent of the firm's Tier 1 capital should consist of CET1 capital.

Now 25 percent of the 3 percent minimum Tier 1 leverage ratio is 0.75 percent, so the leverage ratio expressed in terms of CET1 capital = 3 percent minus 0.75 percent = 2.25 percent.

This implies CET1 leverage = $1/0.0225 = 44.44$.

⁵¹ Prudential Regulation Authority (2015) PRA Rulebook: CRR Firms: Leverage Ratio Instrument 2015. London: PRA, p. 15.

However, Basel III also allows banks to include a 'sin bucket' of non-CET1 capital items as part of their reported CET1.

So let's distinguish between 'reported' CET1 (or CET1 including the sin bucket) and 'clean' CET1 (or CET1 purged of the sin bucket).

Under Basel III rules, the clean CET1 can be as low as 85 percent of reported CET1.⁵²

Let's also assume that bankers make maximum use of the sin bucket so the clean CET1 = 85 percent \times reported CET1.

This means that the Leverage Ratio using clean CET1 can be as low as 85 percent \times 2.25 percent = 1.9125 percent and still comply with the Basel III minimum required leverage ratio. Inverting this number gives the maximum permitted leverage using clean CET1, i.e., $1/1.9125$ percent = 52.29.⁵³

A loss of 2 percent of the leverage exposure would then be more than enough to wipe out a bank's CET1 capital.

52 For more on the 'sin bucket' see T. F. Huertas (2014) *Safe to Fail: How Resolution will Revolutionise Banking*. Basingstoke: Palgrave Macmillan, p. 23, or Basel Committee on Banking Supervision (June 2011) "Basel III: A global regulatory framework for more resilient banks and banking systems," pp. 21-6 and 65.

53 If one took account of the G-SIB buffer, the maximum permitted leverage would be somewhat lower. For example, at the peak of the stress, the maximum permitted leverage would be $52.28 \times 3 \div 3.3 = 47.53$ and this is still very high.

In plain English, *the Basel III capital rules allow banks to maintain remarkably high leverage and still be Basel III-compliant*. Indeed, the Basel capital rules would appear to allow banks to maintain considerably higher leverage than they had on the eve of the financial crisis!

I should also note some qualifications, which will serve to further loosen the impact of the Basel III maximum leverage constraint:

The first is that these calculations ignore sources of hidden leverage such as accounting standards that cause capital to be over-reported, or the additional leverage in off-balance sheet positions.

The second is that the above calculations relate to book values, not to market values, and market-value leverage will typically be higher than book-value leverage.

In fact, since Basel III does not impose any restriction on market-value leverage, the maximum permitted market-value leverage under Basel III is theoretically unbounded.

Then there is the question of what the ‘ideal’ minimum required leverage ratio should be. FDIC Vice Chairman Thomas M. Hoenig has called for a minimum required ratio of 10 percent tangible equity to assets.⁵⁴ In his book, *The End of Alchemy*, former Bank of England

⁵⁴ T. M. Hoenig, “A market-based proposal for regulatory relief and accountability.” Remarks to the Institute of International Bankers Annual Washington Conference, March 13 2017.

Governor Mervyn King wrote that “[a] minimum ratio of equity to total assets of 10 per cent would be a good start.”⁵⁵ Others would go further. Many experts are of the view that this minimum should be close to *an order of magnitude greater* than current minimum capital requirements anywhere in the world, or even higher. There is no magic number but one wants a minimum requirement that is high enough to remove the overwhelming part of the risk-taking moral hazard that currently infects our banking system.

A famous example is an important letter drafted by Anat Admati in the Financial Times in 2010, in which no less than 20 renowned experts recommended a minimum ratio of equity to total assets of at least 15 percent, and some of these wanted minimum requirements that are much higher still.⁵⁶ Independently, John Allison, Martin Hutchinson and yours truly have called for minimum capital to asset ratios of at least 15 percent.⁵⁷ Allan Meltzer, Neel Kaskari, and Walker Todd recommended a minimum of 20 percent for the largest

55 M. King, *The End of Alchemy: Money, Banking and the Future of the Global Economy*, London: Little, Brown, 2016, p. 280.

56 A. Admati, F. Allen, R. Brealey, M. Brennan, A. Boot, M. Brunnermeier, J. Cochrane, P. DeMarzo, E. Fama, M. Fishman, C. Goodhart, M. Hellwig, H. Leland, S. Myers, P. Pfleiderer, J.-C. Rochet, S. Ross, W. Sharpe, C. Spatt and A. Thakor, “Health banking system is the goal, not profitable banks.” *Financial Times*, November 9, 2010.

57 J. A. Allison, 2014, *The Financial Crisis and the Free Market Cure: How Destructive Banking Reform is Killing the Economy*, New York: McGraw Hill, p. 351.

banks.^{58, 59} Admati and Hellwig recommended a minimum “at least of the order of 20-30 percent”.⁶⁰ Fama and Simon Johnson recommended a minimum of the order of 40-50 percent.^{61, 62}

Finally, on the subject of what the optimal leverage ratio might be, I would strongly endorse Morris Goldstein’s careful analysis of this issue, set out in Chapter 4 of his newly published book *Banking’s Final Exam: Stress testing and bank-capital reform*: he suggests that the optimal leverage ratio – and by implication, the optimal minimum required regulatory leverage ratio – should be in the region of 15 percent overall, somewhat less for the smaller and non-systemic banks and somewhat more for the systemic ones.⁶³

THE GUIDING PRINCIPLE: PRUDENCE

A key guiding principle that should govern the Bank’s choices in stress testing (and, indeed, everything else it does) is the Principle of Prudence: when faced with any set of choices, the default should be to go with the most

58 N.Kaskari, “Make big banks put 20% down – just like homebuyers do.” *Wall Street Journal*, February 14th 2017

59 Meltzer is cited in Admati and Hellwig, 2013, p. 311. Todd’s own came from personal correspondence on May 21st 2017 when he said “Start with 20 percent on a leverage basis, not risk adjusted, for the big boys, and then we’ll talk.”

60 Op cit., p. 179.

61 Op cit., p. 308.

62 Op. cit., p. 311.

63 M. Goldstein, *Banking’s Final Exam: Stress testing and bank-capital reform*: Washington DC: Petersen Institute for International Economics, May 2017.

prudent choice. Indeed, the Principle of Prudence is a bedrock principle of good central banking.

This issue comes up repeatedly in the stress tests. Let's consider some examples:

Example 1

The central bank faces a choice over how many stress scenarios to run.

Experts in risk management and stress testing advise strongly against relying on only one scenario.

The Principle of Prudence would suggest that the central bank should run a number of adverse scenarios.

So what does the central bank do?

It runs just one adverse scenario.

Example 2

The central bank faces a number of decisions relating to the severity (or otherwise) of its pass standards. For example, for the leverage ratio test, should it apply the bare minimum regulatory standard, the 3% Basel III standard applied to Tier 1 capital, or should it apply a higher standard?

The Principle of Prudence would suggest that it should opt for a higher pass standard.

So what does the central bank do?

It chooses the lower pass standard.

In fact, for the leverage ratio test, it applies a pass standard that allows for considerably greater leverage than the banks had on the eve of the GFC.

Example 3

The central bank is wondering whether to use the RWA measure in its capital regulations and stress tests. This measure is however highly controversial and has been widely discredited by a number of studies, including some carried out by its own chief economist.

The Principle of Prudence would suggest that the central bank might at least listen to its own chief economist on the matter and avoid using the RWA measure.

So what does the central bank do?

It adopts a capital ratio with an RWA denominator as its preferred capital ratio.

Example 4

The central bank has a choice over which of two core capital measures – CET1 and Tier 1 – to use in its leverage ratio stress tests.

The Principle of Prudence would suggest that it go for the more conservative (i.e., narrower) capital measure, because there are demonstrable problems with the broader one: CoCos and all that.

So what does the central bank do?

It chooses the broader capital measure that is compromised by CoCos.

Example 5

The central bank has a choice over which of two denominators – LE or TA – to use in its leverage ratio stress tests.

The Principle of Prudence would suggest that in each case the central bank choose the maximum of the two.

So what does the central bank do?

It adopts the denominator that is usually lowest.

Example 6

The central bank faces a choice over whether to use book values or market values. A number of outside experts suggest that it should use market values or use the lower of book and market values.

The Principle of Prudence would suggest that the central bank accept this advice even if its own in-house view is that book values are best. After all, it is just

conceivable that the outsiders might be right or might at least have a point, and it would be prudent to take account of that possibility, however remote that might be.

So what does the central bank do?

It chooses to stick with book values alone.

Still on the book vs. market issue...

The central bank faces a choice over whether to adopt the advice of a distinguished external expert who recommends that even if the central bank prefers to base its conclusions on book values, then it should at least publish parallel market value results so that outside analysts could make up their own minds if they wished to.

The Principle of Prudence would suggest that the central bank accept this advice even though it thinks that book values are best. After all, the outsider might just be right and what is the harm in adopting his advice?

So what does the central bank do?

It still chooses to stick with book values only. You see, those outside analysts might get confused if the central bank published parallel sets of numbers, even if the central bank offered them a clear explanation of how to read them.

As it happens, each of these decisions also served to put the banking system in the best possible light. A skeptic

might then say that the central bank was making one imprudent decision after another.

But there is an alternative view. Yes, it might look like each decision considered on its own was imprudent, but you have to consider prudence in the whole. This sounds counter-intuitive until you realise that the purpose of the stress tests is to make the banking system look good. From that perspective, it would have been imprudent for the central bank to have done anything else.

5. The 2016 stress tests

THE BANK'S INTERPRETATION OF THE STRESS TESTS

The Bank reports two headline results for its stress tests. The first of these is the stress test result for the CET1/RWA ratio and the second is the result for the Tier 1 leverage ratio, the ratio of Tier 1 capital to leverage exposure.

The stress is assumed to start at the beginning of 2016 and the peak of the stress is projected to occur at the end of 2017. The core results are as follows:

- The average CET1 ratio is projected to rise from 12.6 percent at the beginning of 2016 to 13.8

percent two years later under the baseline scenario, but to fall to 8.8 percent under the stress scenario.

- The average leverage ratio is projected to rise from 4.9 percent at the beginning of 2016 to 5.3 percent two years later under the baseline scenario, but to fall to 3.9 percent under the stress scenario.⁶⁴

From these results, the Bank concluded that the banking system as a whole is in good shape.

For the individual banks, the test did not reveal any capital inadequacies for four financial institutions (HSBC, Lloyds, the Nationwide and Santander) but problems were identified for the other three:

1. RBS failed to meet the hurdle rates for either test.
2. Barclays did not meet its CET1 SRP before AT1 conversion.
3. Some minor issues were identified with Standard Chartered.⁶⁵

⁶⁴ Bank of England, "Stress testing the UK banking system: 2016 results," November 2016, p. 7.

⁶⁵ The Bank reports results for each bank in Annex 1 of its stress test report. It reports four different sets of peak-stress outcome: 1. Minimum stressed ratios before the impact of strategic management actions or AT1 conversion. 2. Minimum stressed ratios after the impact of strategic management actions (but non-dividend strategic management actions only) but before AT1 conversion. 3. Minimum stressed ratios after the impact of all strategic management actions (including CRD IV distribution restrictions) but before AT1 conversion. 4. Minimum stressed ratios after the impact of strategic management actions and after AT1 conversion. Of these I prefer to work with 3. It is important to consider the impact of all management actions (which rules out 1 and 2), but I have doubts about the reliability of assuming conversions of AT1 (so I prefer to avoid 4).

Based on these results, RBS was deemed to have failed the stress test and all the others were deemed to have passed it.

A STRESS TEST REALITY TEST

Before going any further, let's put the stress tests through a simple reality test:

1. As of the third quarter 2016, the big four banks had about £205 billion in book value CET1 capital and about £149 in market value CET1.
2. The stress scenario was almost as severe as the GFC.
3. The big four experienced losses from the GFC of the order of £440 billion and counting.
4. Therefore we might expect that a shock similar to the GFC would more than wipe out the banks' capital.
5. Yet the Bank of England maintains that its stress tests demonstrate that the UK banking system would not only be able to withstand such a shock, but would still be in good shape afterwards.

To me it seems that this doesn't add up.

Of the seven banks involved in the exercise, the biggest five banks account for over 90% of the leverage exposure. I now drop the other two institutions from further consideration because of their relatively small size. An additional reason for dropping them is that in the analysis below I need institutions' price-to-book (P2B) ratios and these are not available for these two institutions:

NW has no P2B ratio because it is a building society and Santander UK plc does not appear to have a published P2B ratio.

A SERIES OF MISTAKES

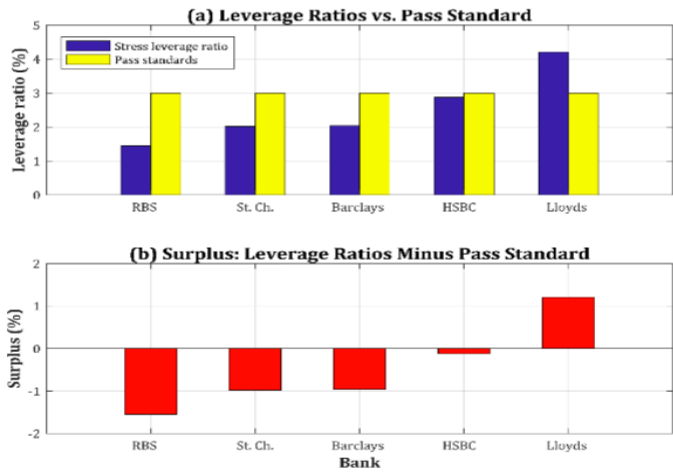
In fact, the Bank made a number of mistakes in the 2016 stress test exercise.

Mistake #1: Reliance on RWAs

The first was to pay any credence at all to the ratio of CET1 capital to RWAs, because the RWA denominator is discredited. We should therefore throw these results away and focus on the leverage ratio results instead.

The leverage ratio used by the Bank was the ratio of Tier 1 capital to leverage exposure. These outcomes are represented in Chart 5.1:

Chart 5.1: Stress Tier 1 Leverage Ratios



The weighted average stressed leverage ratio is 3.95 percent.⁶⁶ Assuming that the pass standard is the 3 percent hurdle ratio, the average surplus over the pass standard is 0.95 percentage points and we get the results reported in Table 5.1:

Table 5.1: Results of Tier 1 Leverage Ratio Stress Tests

Bank	Test result
Barclays	Pass
HSBC	Pass
Lloyds	Pass
RBS	Fail
Standard Chartered	Pass

RBS narrowly fails, but the other banks pass.

Mistake #2: Use of book values instead of market values

However, these results are based on the book-value leverage ratio and the use of book values entails a second mistake: the Bank should have used market values instead. To obtain the market values from the book values, I need first to obtain the corresponding P2B ratios.

⁶⁶ The weighted average is weighted by the relative size of the Leverage Exposure, which is a reasonable proxy for bank relative size.

So consider the following P2B ratios from SharesTelegraph. These numbers apply to the banks on January 9th 2017 and are given in Table 5.2:⁶⁷

Table 5.2: Banks’ Price-to-Book Ratios January 9th 2017

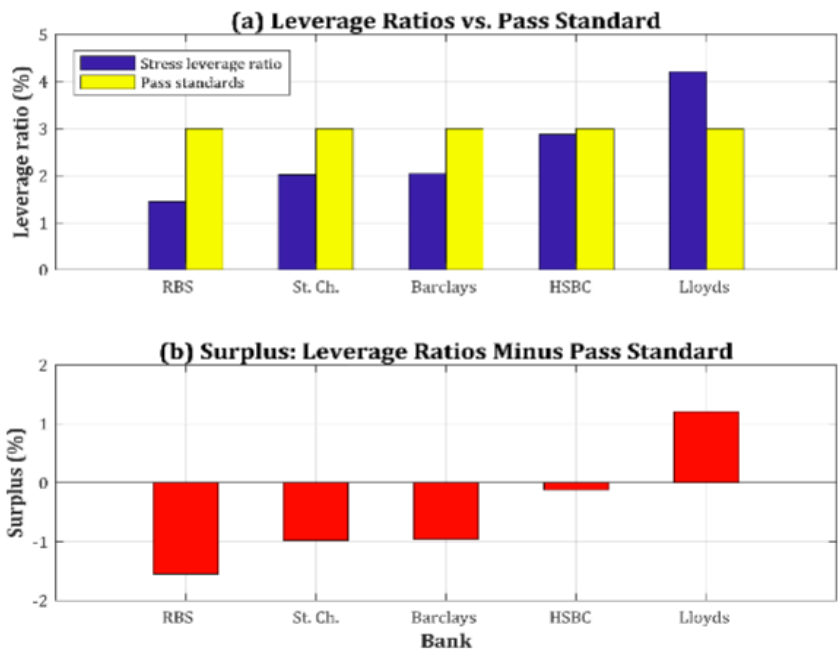
Bank	Price-to-Book Ratio
Barclays	60%
HSBC	67%
Lloyds	98%
RBS	50%
Standard Chartered	47%
LE-Weighted average	66.1%

Notes: These refer to the P2B ratios prevailing at the end of day January 9th 2017 and are based on FTSE data obtained from shares.telegraph.co.uk.

Applying these P2B ratios to obtain the market values from the book values gives us the results in Chart 5.2:

⁶⁷ These P2B numbers were not available to the Bank at the time the stress tests were published, and one would not wish to criticise the Bank for not using values that were unavailable to it. I use these here as they were the ones that featured in the ITN report, but the overall results would not have been that much different had the Bank used the latest P2Bs available to it at the time.

Chart 5.2: Stress Market Leverage Ratios vs. 3% Hurdle Rate



We can summarise the results of this second set of stress tests as follows:

Table 5.3: Results of Market Tier 1 Leverage Ratios Stress Tests

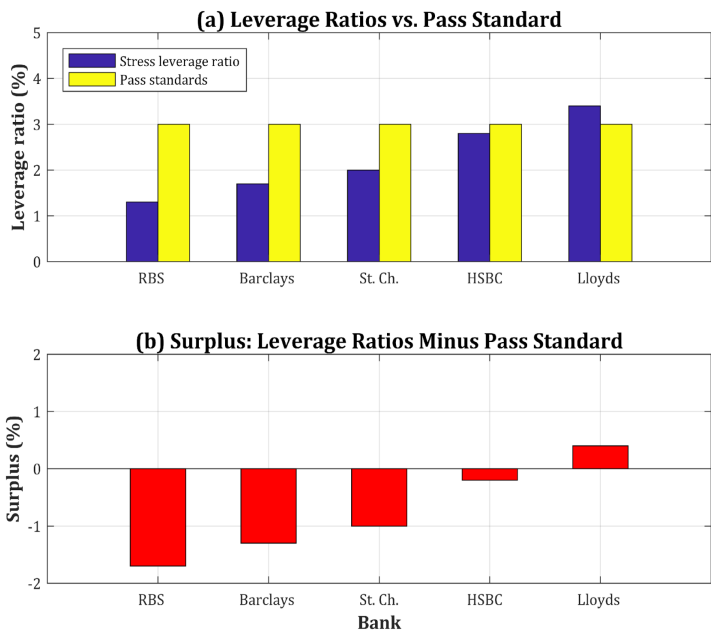
Bank	Test result
Barclays	Fail
HSBC	Fail
Lloyds	Pass
RBS	Fail
Standard Chartered	Fail

All the banks now fail the test except Lloyds. The average stress leverage ratio is 2.65 percent and the weighted average shortfall is 0.35 percentage points.

Mistake #3: Use of Tier 1 capital instead of CET1

However, the Bank used the wrong numerator. It should have used CET1 as the numerator instead of Tier 1 (see Chapter 3.1 above). Using market-based CET1 capital instead of market-based Tier 1 capital then gives the results in Chart 5.3:

Chart 5.3: Stress Market CET1 Leverage Ratios vs. 3% Pass Standard



Again, all the banks fail the test except Lloyds. The average stress leverage ratio falls to 2.4 percent and the average shortfall rises to 0.60 percentage points.

One other adjustment to be made is to replace the 3% hurdle rate with the SRP for banks deemed to be systemic. If we apply this pass standard, we get the same pass/fail results as before but the average shortfall across the system rises to 0.89 percentage points.

Bear in mind that the results I have presented here take for granted virtually the entire stress test exercise as conducted by the Bank: the choice of scenario, the modelling, the settings of the 3% hurdle rate and the SRPs etc.

Had the Bank's stress testers carried out these tests, they would have begun to see that the 'banking system fixed' narrative was beginning to unravel.

SOURCES OF STRESS TEST BIAS AND HIDDEN VULNERABILITY IN UK BANKS

It is also important to examine any sources of potential bias and hidden vulnerability in our 'best estimate' results. It turns out that there are at least five significant sources of such problems.

Sin bucket

The first of these is the 'sin bucket' in the regulatory definition of CET1. Thomas F. Huertas explains:

“Under Basel II, deferred tax assets, mortgage servicing rights and investments in the capital instruments of other financial institutions were all included in core Tier 1 capital [which was the most conservative capital measure used in Basel II]. Under Basel III, these assets are in principle deductible from CET1 capital.”

One of the purposes of introducing CET1 in Basel III was to have a regulatory definition of core capital that excludes these softer capital items. However, the industry lobbied to keep these items in. This result was a compromise by which these assets were not *entirely* deducted from CET1. As he continues:

“as a compromise the members agreed to put the aggregate of deductions under these categories into a so-called sin bucket and to restrict the deduction from CET1 capital to the amount in the sin bucket that exceeded a threshold equal to 15 percent of the bank’s CET1 capital.”⁶⁸

Got that? What it means is that the reported CET1 capital used for regulatory purposes can include these softer capital instruments and their inclusion might inflate the reported measure by up to $1/0.85 - 1 = 17.5\%$ relative to a notional ‘clean’ CET1 that fully excludes them.

⁶⁸ See Huertas, op. cit., p. 23 and Basel Committee, June 2011, op. cit., pp. 21-6 and Annex 2.

In short, if we agree that we want a ‘clean’ CET1 that does not include such instruments, then the reported CET1 has the potential to be biased upwards by up to 17.5%.

Baseline versus stress P2B

My market-value numbers were based on the P2B ratios prevailing on January 9th 2017. In principle I should have used the stress P2B ratios – those prevailing when the stress scenario is most severe. However, I couldn’t use the stress P2Bs because the Bank did not report them and I have no idea what stress P2Bs they might have used, or how they or even whether they used any stress P2Bs at all.

Let’s go back to first principles. We have the book value *Book* and the market value *Market* and

$$(1) \quad \textit{Market} = \textit{P2B} \times \textit{Book}$$

We also have initial values and post-stress values of these variables. Therefore:

$$(2) \quad \textit{Market}_{initial} = \textit{P2B}_{initial} \times \textit{Book}_{initial}$$

$$(3) \quad \textit{Market}_{stress} = \textit{P2B}_{stress} \times \textit{Book}_{stress}$$

We need to select the actual capital measure and I used CET1. (2) and (3) then become:

$$(4) \quad \textit{Market}_{initial} = \textit{P2B}_{initial} \times \textit{Book}_{CET1_{initial}}$$

$$(5) \quad \textit{Market}_{stress} = P2B_{stress} \times \textit{Book CET1}_{stress}$$

Now consider what we do and do not know. We know $\textit{Book CET1}_{initial}$ and we know $P2B_{initial}$. Granted that we know these two items, we can infer $\textit{Market}_{initial}$ from (4). This is standard practice but I am really interested in \textit{Market}_{stress} .

The Bank then does its stress test to come up with a number for $\textit{Book CET1}_{stress}$. Whether that number is any good is another issue, but let's take that as given here. Once we have $P2B_{stress}$ then it follows by (5) that we also have the stress market value, \textit{Market}_{stress} .

All that then remains is to obtain a value for $P2B_{stress}$, but as the Bank didn't report any $P2B_{stress}$ number in its stress test report the best I could do was to use $P2B_{initial}$ as a substitute.

However, I believe that any reasonable $P2B_{stress}$ is likely to be (considerably) *lower* than $P2B_{initial}$ because during a stress prices tend to approach their firesale values whereas book values may fall, but not by as much. Two examples:

- On January 1st 2007, the average P2B ratio for the big four UK banks was 190 percent, but during the Global Financial Crisis, it fell to 33 percent.⁶⁹

⁶⁹ To illustrate, Table B.2. on p. 30 of the Bank's November 2016 Financial Stability Report indicates that the big 4 UK banks' average P2B fell from 190% at the start of 2007 to 33% during the GFC.

- Banks' P2Bs (or more precisely, their ratios of market value to par values) fell sharply in the crisis that occurred after the failure of the Herstatt Bank in 1974. For example, the UK merchant bank Hill Samuel saw its price-to-par value fall to a low of 25 percent before recovering.

If this belief (that $P2B_{stress} \ll P2B_{initial}$) is correct, then my $P2B_{stress}$ numbers would be too high and the 'correct' stress test results would have been worse than my estimates suggested, i.e., my 'pessimistic' stress-test numbers would not have been pessimistic enough.

Hidden off-balance sheet leverage

There is a lot of hidden off-balance sheet (OBS) leverage caused by positions that do not appear on the balance sheet but involve further risk exposure. Sources of OBS exposure include: operating leases; contingent liabilities, including those involving unconsolidated companies that are not fully owned by the parent company; rules that allow netting offsets that hide imperfectly hedged risks; securitisation and Special Purpose Vehicles; Total Return Swaps; Credit Default Swaps (CDS); Collateralised Debt Obligations; Collateralised Loan Obligations and failed sale rules.

Hidden OBS leverage is a hideously difficult subject, however, and I cannot begin to do it justice here.⁷⁰ Suffice to note that many of these instruments are explicitly designed to game the accounting or Basel capital rules, their purpose being to hide risks or exploit arbitrage possibilities to reduce regulatory capital charges (e.g., to game RWAs). Indeed, one can say that the core purpose of credit derivatives is to game the Basel risk weights by allowing banks to move assets from the banking book to the trading book where they are subject to much lower capital charges. Consider this quote from Janet Tavakoli's textbook on credit derivatives:

“The driving force for this revolution in banking is the fact that the BIS risk weighting of the trading counterparty will become irrelevant.”

Meaning that the driving force behind credit derivatives is to make the risk weights irrelevant and so achieve much higher leverage, most of which will be hidden:

“The magnitude of the credit exposure as expressed by trading models will determine regulatory capital requirements. All banks will have an incentive to figure out ways to move assets from the bank book to the credit derivatives trading book. Trades, which

⁷⁰ Gordon Ker provides a nice overview: see G. Kerr, *The Law of Opposites: Illusory Profits in the Financial Sector*, Cobden Partners and Adam Smith Institute, 2011, available at http://www.thebrokenwindow.net/papers/A/ASI_Law_of_opposites.pdf.

did not make sense from a past regulatory perspective, will make sense in the future whether the bank is buying or selling credit protection. The regulatory capital charge in the trading book is a fraction of the charge in the bank book, and exposure netting makes trading book management viable [or seem so: KD].”⁷¹

Ms. Tavakoli’s analysis looks awfully prescient given that she wrote these words almost 20 years ago. Now bear in mind that credit risk modeling was Basel II’s ‘single big thing’ and you can see why Basel II was doomed to fail. Bear in mind too that credit modeling is a central feature of Basel III.⁷²

We should also keep in mind that the hidden OBS exposures will mean that the true ‘at risk’ exposures will be greater (and potentially much greater) than indicated by regulatory measures such as TA or LE, and thus the true levels of leverage will potentially be much greater than suggested by regulatory leverage ratios. The result

⁷¹ J. Tavakoli, *Credit Derivatives: A Guide to Instruments and Applications*, New York and Chichester: Wiley, 1998, p. 241.

⁷² Basel II’s Advanced Measurement Approach to op risk modeling failed as well, and its replacement, the Standard Measurement Approach (SMA) threatens to cause systemic problems of its own. To quote a recent study, the SMA “may present significant systemic risk, as large global systemically important financial institutions are incentivized to take more risk on the one hand and invest less in risk management on the other.” See J. Hinchliffe, “The Death of One Thousand Flowers or the AMA Reborn?” (2016) *Journal of Operational Risk*, Volume 11, No. 4, p. 79.

is that no-one can tell from the published information how leveraged a bank really is.

Level 1, Level 2 and Level 2 positions

Another insight into hidden vulnerability is given by the Level 1, Level 2 and Level 3 fair valuations of banks' marketable positions. Roughly speaking:

Level 1 assets have readily observable prices and reliable fair market values. Level 1 assets include listed stocks, government bonds, or any assets that have a regular "mark to market" mechanism for pricing.

Level 2 (or 'mark to model') assets do not have directly observed market values and are traded less frequently in thin markets, but have (hopefully approximate) fair values that can be obtained from models calibrated to observed market prices. Examples include some corporate and most municipal bonds. Level 2 valuations are at best approximate and can sometimes be gamed by selecting the model that gives the preferred valuations.

Level 3 (or 'mark to myth') assets are highly illiquid and can only be fair-valued using models calibrated to guess-timates of key parameters. Level 3 valuations are unreliable and potentially highly gameable, because both models and calibrations can be chosen to manipulate valuations and this gaming is difficult for outsiders to detect. Examples include asset-backed and mortgage-backed securities and many forms of CDS. The experience of the GFC showed that Level 3 positions can be wiped out in a major crisis.

Table 5.4 gives the 5 big banks' Level 1, Level 2 and Level 3 positions for the end of 2016 expressed as percentages of their CET1 capital:

	Level 1	Level 2	Level 3
Barclays assets	174%	1,060%	60%
Barclays liabilities	57%	980%	31%
HSBC assets	368%	427%	9%
HSBC liabilities	40%	54%	5%
Lloyds assets	479%	214%	3%
Lloyds liabilities	358%	215%	20%
RBS assets	176%	1,030%	15%
RBS liabilities	64%	998%	10%
St. Ch. assets	176%	341%	6%
St. Ch. liabilities	7%	216%	2%

Notes: Based on banks' 2016 Annual Reports.

Here are the main takeaways:

- The Level 1 numbers indicate significant market risk exposure to Level 1 positions. For example, Barclays' Level 1 assets are 174 percent of CET1, so a 20 percent fall in assets values would imply a loss of almost 35 percent of CET1.
- The Level 2 numbers indicate large exposures to Level 2 positions. Barclays' Level 2 assets are 1,060 percent of CET1 capital. All the banks are highly exposed not only to Level 2 positions' market risk, but also to gameability and other weaknesses in the models used to value these positions.
- The Level 3 numbers indicate relatively low exposures to Level 3 positions. The exception is Barclays, whose Level 3 assets are equivalent to 60

percent of CET1. Bearing in mind the unreliability of Level 3 valuations, this exposure is a red flag.

We should not assume that banks' assets and liabilities are in any way perfectly hedged, e.g., we should not assume that Barclays' net Level 3 position is equal to its Level 3 asset position of 60 percent minus its Level 3 liability position of 31 percent. This last point reminds us that all these valuations are based on assumptions about netting and hedge effectiveness that may not be reliable and are also open to gaming.

Inadequate accounting standards

A final source of bias is inadequate accounting standards. The weaknesses of IFRS accounting standards have been well-documented: they include the overvaluation of retained earnings, asset values and profits; and inadequate provisions for expected losses.⁷³ To quote a recent letter in the Financial Times:

“... better forecasts and better weatherproofing both depend on a deeper problem being resolved: the poor quality of the numbers we are relying on to tell us what banks' capital actually is. Is the stated “capital” in fact capable of absorbing lending or trading losses that inevitably come in a downturn?”

⁷³ For more on these issues, see, e.g., Local Authority Pension Fund Forum, UK and Irish Banks Capital Losses – Post Mortem, September 2011, or No Stress II, Chapter Two, section 6.

“At the heart of the crisis would appear to sit faulty accounts and unreliable audits. In the EU alone, between September 2008 and the end of 2010, more than 300 banks went cap in hand to governments for support—in the form of capital injections, asset relief, liquidity aid or debt guarantees. Few banks [had been] identified as having insufficient capital [prior to September 2008].”⁷⁴

All of these banks had previously been signed off as capital adequate by their regulators. That is some failure by the regulatory system. To continue:

“The fact is that bank accounts — drawn up according to IFRS accounting standards—showed “profit” and “capital” that overstated their true strength. Supplementary regulatory disclosures of capital under the Basel framework help little as they lean heavily on these faulty accounting numbers, and are themselves unaudited.”

Further concerns about accountancy standards were expressed by Iain Coke, the head of Financial Services at the Institute of Chartered Accountants of England and Wales in May 2017. “[M]any people were more confident than they should be” about banks’ key regulatory capital ratios, he stated. “There is almost an

⁷⁴ N. Landell-Mills, K. Quinn, E. Tracey, R. Collinge, R. Talbut and F. Curtiss, “Clearer picture of banks’ capital is required to help avert crises,” *Financial Times*, January 12th 2017.

assumption that someone else is poring” over them. These concerns came a month after the Central Bank of Ireland had ordered all banks operating in Ireland to review their operating procedures after an investigation there found that standards “were significantly below what is expected”.⁷⁵

There is also evidence that IFRS overvaluations of bank assets can be large. Consider this quote from an Irish Parliamentary Committee:

“IAS 39 operates on an incurred loss basis as opposed to an expected loss basis. Under IAS 39, NAMA [National Asset Management Agency] could not have provided for expected future losses. At the end of 2013, the board expected future losses but could not provide for them under IAS 39. In setting the £1.3 billion minimum price, the board was, in effect, recognising and bringing up front, losses of at least £175 million. The board was aware that the end of 2013 £1.49 billion carrying value needed to be adjusted to take account of losses that it expected to take in future years but could not yet recognise in its end of 2013 accounts under IFRS. The fact that there was an actual loss of £162 million on the sale which was recognised in 2014 accounts is not in dispute.”⁷⁶

75 N. Megaw, “Banks overconfident about capital strength, accountancy body warns,” *Financial Times* May 14th 2016.

76 Dáil Éireann, Committee of Public Accounts, November 24th 2016, p. 15.

£162 million divided by £1.49 billion implies an overvaluation of a little over 12 percent. Tim Bush provides an explanation:

“The debate was necessary due to discrepancies between what assets were being held at in the accounts and what they were being sold at. NAMA was having to defend the level of discounts it was taking by referring to the significant accounting discrepancy. Given that a 12% overvaluation of assets is sufficient to more than wipe out the assets of a bank with even 10% leverage, and given the Bank of England’s target leverage ratio is only 3%, then it is difficult to reconcile that with, not only Dr Carney’s confidence in IFRS, but his confidence in the banking system with IAS 39 still operative.

“However, with one other fact even that pales into insignificance. The NAMA portfolio in question had already been acquired from the Bank of Ireland at a 44% discount to the value booked in the accounts, i.e. the portfolio had been overvalued by nearly 79%.⁷⁷ Such levels of overstatement easily explain the collapse of not only the other Irish banks, but HBOS, RBS, Bradford & Bingley and Northern Rock in the UK.”⁷⁸

It is important to appreciate that because of leverage, even small errors in reported asset values can translate

⁷⁷ Source: Bank of Ireland: Group Overview y/e 31 December 2010.

⁷⁸ T. Bush, “Rights Issues and Capital,” Pensions & Investments Research Consultants Ltd., forthcoming report.

into large errors in the reported leverage ratio or capital ratio. Suppose that there is a 1 percent overstatement in the reported asset value.⁷⁹ Then it is easy to show that the reported capital will be subject to an error of much the same (absolute, not percentage) magnitude as the error in the reported asset value. So if the bank has a reported capital to asset ratio of 3 percent, then the true capital to asset ratio will be 3 percent minus 1 percent = 2 percent. If the error in the reported asset value is 2 percent, the true capital to asset ratio will be 1 percent, and if the error in the reported asset value is 3 percent or more, then the true capital to asset ratio will be zero percent or negative. In short, an accounting system that is prone to over-value asset values can lead to a situation where banks' true capital ratios are much lower than they are reported to be.

Nor is it just reported asset values that are the problem. If retained earnings or profits are inflated – and the IFRS rules give bank management plenty of scope and incentive to game these figures – then inappropriate distributions of dividends and bonuses will be made, which will have the effect of secretly depleting bank capital and inflating reported capital figures – and once again, you cannot tell from the reported figures what the true situation actually is.⁸⁰

79 Suppose that assets are reported with an error x . Since capital equals assets minus liabilities, then capital will also be reported with the same error x . If c is the true capital and A the true asset value, then the reported capital ratio will be equal to $(c+x)/(A+x)$ which will be approximately $(c+x)/A$ if the bank is highly leveraged.

80 There are also important data, data systems and data reporting issues which are discussed further in No Stress II, Chapter Two, section 5.

It is not for nothing that the balance sheets of the big banks have been described as the blackest of black holes.

CONCLUSIONS

The conclusions are stark. The Bank of England made a number of errors in its stress test exercise and correcting for these errors leads to a much gloomier assessment of the financial health of the UK banking system. Most, if not all, of the big banks would have failed the test and are demonstrably capital inadequate. As if that were not bad enough, my 'best estimates' of the stress leverage ratios are subject to number of upward biases and other sources of vulnerability that suggest that the true picture is even worse, and potentially much worse, than my numbers suggest.

6. Deflating the Bank's Treasury Committee evidence

This Chapter examines the January 11th 2017 Treasury Committee meeting at which the Bank witnesses faced a grilling from MPs on a range of different subjects, the common denominator being the Bank's credibility or, rather, the lack of it.

Let's go through the salient points.

BREXIT AND MICHAEL FISH MOMENTS

The week before, Andy Haldane had had his “Michael Fish moment.”⁸¹ Speaking at an event in London, he admitted that economic forecasts had been wrong before the financial crisis, and that criticisms about forecasts being wrong on the immediate impact of a Brexit vote were a “fair cop”. Prominent amongst those who made these erroneous forecasts was the Bank itself.

So it was hardly a surprise that the Chair started off by asking Carney if he still stood by the Bank’s earlier Brexit analysis. To quote:

Q120 Chair: “... I feel I should begin by asking you, Governor, whether you agree with your chief economist that the Bank of England has been having a “Michael Fish moment” or, as he suggests, two of them.”

Dr Mark Carney: “One of the advantages of banishing groupthink is that one does not always agree with everything that is said by colleagues.”

81 For non-UK readers and UK readers those below a certain age, Michael Fish is a well-loved BBC weatherman who made a famous forecast on October 15th 1987: “Earlier on today, apparently, a woman rang the BBC and said she heard there was a hurricane on the way ... well, if you’re watching, don’t worry, there isn’t!” That evening, the worst storm to hit South East England for three centuries caused record damage and killed 19 people.

Now groupthink is an organisational dysfunction that cannot just be banished and it seems to me that the Bank of England has been riddled with it for a long time, but let's move on.

Carney did not share Haldane's view. He acknowledged that the Bank had concluded in November "that the biggest risks to financial stability in the UK are global and not Brexit-related", i.e., the Bank had changed its position on Brexit and hence the headlines about the Bank's Brexit U-turn.

However, he suggested that this change in its position was not some horrendous Michael Fish forecast error, but actually reflected the success of the measures that the Bank took in the wake of the Brexit vote:

Q121 Chair: [Implied question:] "We did not have a Michael Fish moment because, in this case, the forecaster can influence the outcome."

Dr Mark Carney: "With respect to financial stability risks around the referendum, I do think we helped to make the weather, if I can say that. Meteorologists predict the weather; we helped to make the weather in that we catalysed contingency plans, actions, pre-positioning of collateral, other steps with other major central banks and better risk management, which helped to ensure that this was a smooth process and put the country in a better place to take advantage of the opportunity [of Brexit?]."

Put another way, the Bank's forecasting 'failure' was actually a success because the Bank's actions prevented the outcome that it had forecast!

Now this is a clever argument, but I don't buy it. Let's suppose that the Bank had been right about Brexit risk before the vote. But if this were so, why didn't the Bank at the time anticipate that it would have responded as it did, which was easy enough to do. It should then have said that yes, Brexit was a risk but the Bank has the means to handle it so there is nothing much to worry about after all. The Bank didn't say that, however. Instead, it sounded warnings that turned out to be wrong. So Haldane is right to plead out on this one.

This argument is also unscientific because you cannot defend forecasts that cannot be falsified. By this logic, every time that the Bank gets a forecast wrong, it could claim that it did not really get it wrong, because the forecasted event was averted by its own policies and but for those the forecast would have been right. Monetary policy is now so skilfully carried out that those long and variable lags of old have been abolished. By this logic, the Bank would be able to claim that it was right whenever its forecasts were right, and that it was also right whenever its forecasts were wrong. Its forecasts would never be falsifiable.

If you are still not persuaded, consider this example. Michael Fish makes a weather forecast in 1987 and his forecast turns out to be wrong. Fair cop, says an embarrassed Mr. Fish. Now imagine that Michael Fish forecasts a hurricane in 2017 and again gets it wrong.

“You’ve done it again, Michael!” everyone says. “Oh no I haven’t,” he responds. “Yes, the forecast as such was incorrect, but this is not a fair cop.” You see meteorology has moved on and in the meantime Michael has learned to control the weather, and the reason his hurricane did not materialise was because he took measures to avert it. Michael wants credit for averting his hurricane and I am the first to acknowledge the splendid job he did. But I still have to ask him why he frightened the hell out of us with his weather forecast when he knew that he would use his meteorological magical powers to stop it.

FORECASTING FAILURES

A little later, Jacob Rees-Mogg again raised the issue of forecasting:

Q146 Mr Jacob Rees-Mogg: “... In his “dappled world” speech in early November, Mr Haldane raised some really interesting questions about what I think he called “methodological monoculture” and the concern that forecasters were so guilty of groupthink that it was very hard to get anything valuable out of them except in times of stability. You know that I have been critical of the forecasts the Bank made about Brexit. How can the Bank take account of what Mr Haldane is saying and get to a point where it is able to forecast when there are discontinuities?”

Dr Mark Carney: “One of the ways we take account of what Mr Haldane says is by him being the chief

economist of the Bank of England. One of the responsibilities of the chief economist of the Bank of England is the preparation of the economic forecast, which is why he is a member of the MPC.”

Mr Jacob Rees-Mogg: “His forecasts have been the same as everybody else’s.”

Rees-Mogg: 1, Carney: 0. Then Dr. Carney went on to explain that the FPC was mainly concerned with the tail than the central tendency:

“The way we have to get better—and where, I would suggest, to some extent the Bank of England and the profession have got better relative to pre-crisis—is through a much more explicit focus on the tail: what could go wrong, as opposed to what is going right.”

There is however no hard evidence that any of them are any better at tail risk analysis than they were pre-GFC: Brexit tail risk comes to mind, for instance. To return to Dr. Carney:

“We have to continually ask ourselves what can go wrong. ... Somebody can legitimately stand here and say, “Really? You ran a stress test with the whole economy going down 2%, commercial real estate off 30%, housing off 30%, unemployment at 9%, a market crash and misconduct all coming at the same time. Is that really a severe but plausible scenario?”

Bingo. They might also ask why such a severe fall in housing led to such a low loss rate in their stress test,

when experience elsewhere indicates that a large fall in real estate leads to much higher loss rates. Or they might ask whether there were any outsiders who might have expressed any doubts about the reliability of their stress analysis. So we return to the central issue of whether the stress tests are any good.

THE STRESS TESTS

Shortly after, Steve Baker subjected the Bank witnesses to a searching cross-examination on that subject that flushed out the main problems. He began by asking Martin Taylor if he was surprised that all banks didn't pass the stress test.

Mr. Taylor's response boiled down this:

"It was a hell of a stress the combined size of the shock was larger than we have had in previous years ..."

A hell of a stress? A severe one to be sure, but one cannot defend blanket claims to the effect that the 2016 exercise was the most severe yet unless they are suitably qualified. For example, the 2014 exercise had unemployment rising to 12%, whereas the 2016 exercise only had unemployment rising to only 9.5 percent. By that yardstick, the 2016 exercise was considerably less stressful than the earlier one. The true situation is more nuanced than Mr. Taylor suggests.

Mr. Baker then asked Anil Kashyap to comment on the ITN report and Sir John Vickers' statement that, nine

years after the financial crisis, progress to ensure that the banking system is more resilient had been “really disappointing”.

Professor Kashyap did not share that view. We “have raised the amount of capital in the system immensely” he said, before going on to explain why he regarded the stress test programme as “one of the most stability-enhancing things that have come into the regulatory toolkit.”

Well, lets stick to facts. Going into 2007, the big four UK banks had £116 billion in book Tier 1 capital. As of the end of 2016q3, they had book CET1 capital equal to about £205 billion. This is an increase but hardly an immense one. Now I grant that CET1 is of superior quality to Tier 1, but this is an increase of less than £90 billion – and this comparison does not take account of the way banks’ market values have deteriorated since 2007.

And for the merits of the stress test programme, that is exactly the point at issue.

Mr. Baker then turned to Alex Brazier and asked him his view of Vickers’ claim that the stress tests should be “more rigorous, more robust”.

Mr. Brazier responded by saying that anything Sir John said he was very keen to consider, but after very careful consideration the Bank chose not to agree for a variety of reasons which he then goes into:

“On the issue of the rigour and robustness of the stress tests overall, this year’s test ... was one in which the scenario was at least as tough as the financial crisis.”

Not so. To quote p. 6 of the Bank’s own stress test report: “Overall, the UK stress is roughly equivalent to that experienced during the financial crisis, albeit with a shallower fall in domestic output ...” So the Bank’s stress scenario was not quite as stressful as the GFC.

“The losses that resulted for this group of banks were five times what they experienced in the financial crisis.”

Not so. Cumulative losses to date for the big 4 are of the order of £440 billion.⁸²

“The losses were such, in terms of the decline of their capital ratio, that they would have wiped out the entire capital base of the British banking system in 2007. That is how severe the test was.”

Not so. Mr. Brazier is referring here to the £44 billion projected losses, but as I have pointed out, the Tier 1 capital of the big four banks alone going into 2007 was £116 billion and a loss of £44 billion does not wipe out capital of more than £116 billion.

“On the rather narrower point of using market-based measures of equity, it is worthy of consideration, but

⁸² See Ferguson, “UK bank ‘stress’ test,” p. 2.

let me tell you why I come down on the side of not using it. Put aside the fact that the market value of banks' equity is currently higher than the regulatory measure that we use. For the major banks, the market value of their shareholders' equity is £270 billion. In the stress test, we assume they have £230 billion-worth of regulatory capital, so it actually points to a slightly stronger banking system than the one we use in the stress test. I do not want to use that, because it includes things that I do not want to include in regulatory capital."

This is a straw man argument and also one that implicitly concedes a major problem with what the Bank did. Neither Vickers nor I are suggesting that the Bank of England should have used the market value of banks' equity as its capital measure. We are saying that they should have made appropriate market-value-based adjustments to their book values of core capital.

Going further, the Bank should not have used Tier 1 as its core capital measure at all. As I explained in Chapter 3.1, Tier 1 is less attractive as a core capital measure than CET1 because Tier 1 includes CoCo bonds and CET1 excludes them. Since CoCo instruments are not of the same quality as CET1, the leverage ratio stress tests should be based on CET1 and not Tier 1.

I am not sure of Mr. Brazier's numbers because his dates are not too clear, but let's consider the situation as the end of 2016q3. Using data from their financial statements, the big four banks had about £303.5 billion in shareholder equity. I understand him to be saying that

the Bank used Tier 1 capital, which was about £245 billion. He then seems to suggest that this one reduction is enough and I say it is not. The Bank should then have reduced further to CET1 capital, which was about £205 billion. But this figure is the book CET1 value, and the corresponding market value of that CET1 capital was about £149 billion. One should then do the stress analysis and make sure that the stress market-value CET1 uses a stress P2B which ought to be lower than the current or baseline P2B.

To return to Mr. Brazier:

“Put aside, as well, the fact that, if you had done this before the crisis, you would have been led completely astray, because banks were being valued extremely highly by a market that was effectively mispricing risk across the board. You would have been led to the conclusion that the British banking system was remarkably resilient, and, as forecasting errors go, that would have been quite a good one.”

Touché! Banks’ share prices *did* signal problems in advance of the crisis and, to quote the Bank’s own chief economist, “market-based measures of capital offered clear advance signals of impending distress” whereas the Bank’s own models and all its preferred metrics did not: Michael Fish again.⁸³

“Putting those things aside, *what really matters is that we include in the stress test the things that the market*

83 Haldane, 2011, p. 8.

price is reflecting, to the extent that we believe them. *Right now, those market prices are typically reflecting a fairly weak earnings outlook, consistent with recent past performance*, and the prospect of quite significant conduct redress fines. Those things are incorporated in the stress test. We should challenge ourselves, and we do, to say: “Given what we are incorporating in the stress test, is there anything else in the market valuation that we cannot explain with these results and that we should include?” The answer we came to after rigorous analysis this year, last year, and the year before is no.

“The underlying argument is that the UK banks are sitting on currently unrealised credit losses. We should entertain that possibility, and we look very carefully, as we do in the report, at market measures of their loan portfolios, at their non-performing loan rates relative to their provisions and capital, and *none of those indicators give us cause for concern* about that particular point. *We are confident that the things in the stress test are consistent with what the market is pricing in.*” (My italics)

My interpretation of Mr. Brazier’s comments is that the Bank does take some account of market valuations, and I am very pleased to hear that. But what worries me from the parts of the passage that I have italicized is that he appears to be discussing the baseline scenario, and the stress scenario is supposed to be more severe. Look at the last sentence: “*We are confident that the things in the stress test are consistent with what the market is pricing in.*” He appears to be suggesting that the Bank

applies current P2B ratios in its stress scenario, instead of, well, stressing them. That might be a problem.

Then there was the question of the replicability of the results I had given ITN:

Q174 Mr Steve Baker: “I want to ask you a couple of questions, Governor, in a moment, if you will just bear with me. Mr Brazier, before I come to the Governor, can you be absolutely clear? Sir John’s arguments were taken, and ITV had my friend and colleague Kevin Dowd run some numbers, and only Lloyds passed the tests. Now, if it were the case that only Lloyds would pass if one took into account Sir John’s recommendation on valuations, then we would have a very serious capital problem, wouldn’t we? Can you just confirm that you are not concerned that the only robust bank is Lloyds?”

Alex Brazier: “I do not share that conclusion. I have had someone rerun the numbers, and, to be honest, I cannot replicate those numbers using the data of the bank valuations. Even so, the general point still applies, which is whether it is the right thing to do.”

So Mr. Brazier’s team were unable to replicate my findings. Well, let me help them. The single biggest change is to apply a P2B number to the book value number, even to the Tier 1 book value, but preferably to a CET1 book value number. Then you get close to the numbers I gave to ITN.

However, let me stress that one really needs to apply stressed P2B numbers not current or baseline ones and that would likely have produced even poorer outcomes, but I was unable to do that because the Bank did not report any stressed P2B numbers.

Governor Carney then offered his view:

“I would just make the point that there is a double count here, as Mr Brazier just said. Price to book ratio shows the market cap versus the book value of equity. We do not use the book value of equity. We take the book value of equity, and then we reduce it for things that will not be there when times are tough. That is the lesson of 2008: no deferred tax assets, because if you are a lousy bank, those are not real assets; no goodwill, because you have no intangible value; no value to investments in other financial institutions, because, if times are tough, those are probably worth nothing as well.

“The fact is that the book value is reduced substantially, for regulatory capital purposes. What has happened here is that they have taken that lower number and multiplied it by the ratio, so they have double counted it. I am sorry; they could have come and asked us how to do the calculation and we would have helped them with it, but they did not. They have just double counted on it.”

I am puzzled at Governor Carney’s suggestion that I must have made a double-count error given that no-one at the Bank had seen my spreadsheets and that his

colleague had just told the Committee that the Bank was unable to reproduce my numbers.

He is right however that deductions need to be made from shareholder equity. These include, e.g., intangibles and unreliable capital instruments such as AT1. Therefore it is not enough to reduce down to Tier 1; it is also necessary to reduce further to CET1. From this starting value, it should have reduced it further again to obtain the book CET1 under the stress. It should then have obtained the corresponding projected market value CET1 under the stress, which it apparently did not, and it should have obtained the stress market value CET1 by multiplying by the projected stress P2B, not the latest or baseline scenario P2B. The Bank itself made a number of mistakes here – and they were big ones.

And so the core of his rebuttal – “What has happened here is that they have taken that lower [capital] number and multiplied it by the ratio, so they have double counted it” – is simply wrong.

I did not double-count; instead, the Bank did not count down far enough.

Governor Carney then continued:

“That raises an important point, which is what the market value, whether it is a CDS spread or price to book value, tells you. As typical glass-half-empty, prudent central bankers, we care a lot more about when it is below book value. What is it telling you

and why? We look at the asset quality. We run £100 billion-worth of impairments through these guys in two years, which is how you stress the value of the things. We did that, and let me underscore that you end up with capital that is twice what they had going into the financial crisis, after having had five times the losses.”

The losses in the 2016 stress projection were not five times the losses over the peak of the GFC, but less than a tenth of them.

“There is a point at which somebody says, “Do you have too much capital in the system?” as opposed to “Do you have enough?””

So the big four had £159 billion in book CET1 at the peak of the stress (and presumably considerably less in market value CET1) and this might be too much to prudently ensure the resilience of banks with just under £5 trillion or £5,000 billion in total assets? I don’t think so.

“To take the market point and the return point seriously, we do two things. One is to say, “In our stress test baseline, before the world goes poorly, what is the path of profits? Is it at all consistent with what the market is valuing?” You do a dividend discount

model and look at the various costs of equities.⁸⁴ We end up with a price to book of about 0.75, which is roughly where the market is right now. Their baseline is weak profitability.”

I.e., poor cash flows. However, those cash flows are the banks’ preferred means to rebuild their resilience given that (a) they are reluctant to issue more shares and (b) they cannot resort to asset sales because of the fire sale problem. OK, so Governor Carney explains the Bank’s pessimistic baseline analysis, but his statement tells us nothing about the (even more pessimistic?) stress scenario.

All I can glean from the statements of the Bank witnesses is that the stress scenario involved some projection of low future returns. But it would be nice to know more, e.g., did they, or did they not, stress the P2B ratios and, more generally, how do the baseline and stress scenarios differ from each other? Clearing up these issues would go a long way towards resolving controversy over the tests.

84 From an outsider’s perspective, the Bank’s model is a black box, but even so, one can occasionally glimpse a rare ray of light going into it. In footnote 3 of his December 19th 2016 letter to Vickers, Governor Carney points out that the Bank used a 13 percent cost of equity in what I understand to be its baseline scenario. This cost of equity is very high and well out of line with mainstream estimates that put it at under 5 percent. It is important that the Bank’s projections be based on credible calibrations and that the Bank give some assessment of the robustness/sensitivity of its results to key input assumptions.

In the meantime, we can be thankful for the stress tests' reassurance that bank share price weakness does not signal bank weakness.

Let me end by returning to the subject of the weather. If the Bank can make the weather when it comes to Brexit, then it would also make sense for it to make the weather on banks' low future profitability. It could do so by raising interest rates. If the banks are now resilient again, as the Bank maintains, then they should be able to withstand any shock entailed by such a move, and higher rates would boost banks' net interest margins and thereby their profitability. Higher rates would also give the Bank some much needed room for manoeuvre if the economy were to go into recession again and the Bank then wished to respond in the traditional way by reducing rates to give the economy a boost.

Just a thought.

7. The fatal flaws in the stress tests

There are many flaws with the stress tests that I addressed at some length in *No Stress II*. The majority of these are not just any old flaws, but *fatal* flaws, any one of which *on its own* would be enough to discredit the entire exercise.

Here is a brief summary:

Flaw #1: The stress tests consider only one adverse stress scenario

A stress test is a model-based guess about what might happen and the world is an uncertain place. Consequently, if you choose to rely on such guesswork, then it would be unwise to rely on a single adverse scenario: no one scenario can give you confidence that

the banking system is safe in the face of all the other scenarios that you didn't consider.

For example, what reassurance do the 2016 stress tests give us that the UK banking system will be safe if the next big shock emanates from the Eurozone or mainland Chinese banking systems, say?

None.

And why?

Because it did not *even consider them*.

Flaw #2: The Bank's stress scenario is insufficiently stressful

The chosen scenario was adverse but not especially so – a little less severe than the GFC in terms of its impact on GDP. Therefore the stress test gives us no idea what might happen if there were a shock bigger than the GFC.

Such robustness issues are also highly non-linear. Even if we accepted that the Bank's stress tests were correct in suggesting that the UK banking system could withstand a shock similar to the GFC and still be in good shape, then that still does not provide any reassurance that the system would still be well after a moderately larger shock.

Suppose that a stress test on a bridge demonstrates that

it can safely withstand a certain shock. Does that imply that it can withstand a bigger one?

Flaw #3: The Bank's modelling of the impact of its stress scenario on the UK banking system is clearly inadequate

The modelling of the feedback link between the stressed environment and the resulting bank losses is clearly inadequate because the Bank's stress scenario produces implausibly mild projected losses for UK banks:

Flaw #4: The Bank of England lacks the forecasting record to produce credible stress scenarios

We can only have confidence in the Bank's 'forward-looking' stress projections of adverse scenarios if we can have confidence in the Bank's forecasting record, but that record is positively dire: the Bank has had more Michael Fish moments than Michael Fish.

Flaw #5: Headline stress tests are undermined by their reliance on useless risk weights

The Bank's headline stress tests – those based on the ratio of CET1 capital to Risk Weighted Assets (RWAs) – are undermined by the hopeless RWA measure.

A low RWA does not mean that the bank concerned has low risks; instead, it usually means that it is taking a lot of risks that are invisible to its risk measurement system.

Flaw #6: Stress tests are undermined by their reliance on useless risk models

The stress tests are undermined directly by their dependence on the Bank of England's and the banks' own risk models and indirectly by their reliance on the Basel capital adequacy regime, which itself also depends on risk models that have proven themselves to be useless. The main reason why is because the models are used for risk management purposes and risk takers have an incentive to game model-based risk control systems: no model can take account of the ways in which it might be gamed.

The risk models are therefore subject to a strong-form version of Goodhart's Law by which any risk model will break down when used for risk control purposes.

Going deeper still, all these models including the stress tests merely give the illusion that financial markets are mathematizable, when experience shows that they are not.

Flaw #7: The stress tests are undermined by core capital measures that overstate core capital and by leverage exposure measures that understate total risk exposure.

Flaw #8: The pass standards used in the Bank of England's stress tests were too low

A Tier 1 pass standard of 3 percent or a little more allows for high levels of leverage. For example, a 3 percent Tier 1 pass standard allows for Tier 1 leverage of 33. Such a pass standard allows for even higher leverage in terms of book CET1 and for theoretically unlimited leverage in terms of market-value CET1.

The Bank's pass standards are also less demanding than the higher minimum requirements coming through in the United States or the much higher minimum capital standards recommended by many experts.

Flaw #9: Conclusions from stress tests are not robust to reasonable changes in the pass standards

Had the Bank increased the pass standards even modestly, then the weakness of the banks would have soon have become apparent. For example, had the pass standard been 4 percent in terms of book value CET1, then only HSBC and Standard Chartered would have passed; and had the pass standard been 4 percent in terms of market value CET1, then it would appear that all banks would have failed.⁸⁵

⁸⁵ Strictly speaking, I can only be sure that the five biggest banks would have failed, as I don't have P2B ratios for the other two. However, as these banks are not notably stronger than the big five, one would be surprised if they managed to pass when the big five do not.

Flaw #10: The 2016 stress tests exhibit basic failures of due diligence

The 2016 stress testers failed to challenge the obviously implausible loss numbers their numbers were generating from a supposedly 'hell of a stress' stress scenario. They failed to stress test their stress test results against even moderate changes in the adversity of their scenario or in their pass standard.

Any of these checks should have started to flag up problems that the stress testers missed.

Flaw #11: Regulatory stress tests involve an inherent confirmation bias

These failures highlight one of the major contradictions at the heart of regulatory stress testing: that they are used in practice not to challenge preconceived views, but to confirm them.

Imagine that some central bank stress tester did a conscientious job and came to conclusions that contradicted the corporate line. They then reported them to the senior management who have publicly reassured us that the banking system is resilient. What do you think would happen then? Even if someone voiced a few doubts in a meeting, they would be drowned out by the prevailing collective groupthink, which in turn and for obvious reasons, would hardly be inconsistent with the senior management's view.

This confirmation bias makes it difficult for a stress tester, however able, to spot warning signs – and the in-house culture of the central bank implies a lot of pressure to toe the line and not get a reputation for being ‘difficult’.

Such people do not thrive in regulatory agencies: they are not welcome in them and they are soon weeded out. That is the way these organisations work.

The credibility of the exercise is therefore undermined by the inability of in-house stress test experts to challenge the corporate line even if they were minded to and willing to resist the pressures to conform. The senior management can then say that their views are supported by a whole team of in-house experts who say that the stress tests are credible, severe and so on, and they would have a point.

Flaw #12: The credibility of the stress tests is undermined by conflicted objectives, outside pressure and an inability to address the risks that regulators themselves create

The credibility of the stress tests is undermined by the conflict between the two main objectives of the exercises, namely, to determine the financial strength of the banking system and to promote confidence in the banking system.

The credibility of the Bank’s stress tests is undermined by the pressures from the industry and from the

government under which it must operate, and both of these parties have a vested interest in the ‘banking system is sound’ narrative

The credibility of the stress tests is undermined by a massive blind spot at the heart of any central bank stress testing programme: the single biggest factor contributing to the GFC was the regulatory system itself, including the Bank, the FSA and the Basel system. So that regulatory system introduces stress tests to demonstrate the resilience of the banking system to the risks it faces, but how can those stress tests possibly take account of the risks to financial stability created by the regulatory system itself? There is, therefore, an inherent contradiction at the heart of regulatory stress tests: they can’t be expected to take account of the risks that the regulatory system itself creates – and these are the biggest risks of all.

Flaw #13: The credibility of the stress tests is undermined by Public Choice considerations

The credibility of the exercise is undermined by the central bank’s own self-interest. If the central bank were to conclude that the banking system was unsound, then it couldn’t ever admit that in public: to do so would undermine public confidence and concede that its own policies towards the banks had been a failure. As a consequence, the stress tests can only be expected to come to one conclusion – that the banking system is sound – regardless of what the Bank of England might privately believe.

Put another way, the credibility of the stress tests is undermined by Public Choice considerations. Public choice theory tells us that regulatory agencies pursue their own self-interest, and in this context the regulatory agency's self-interest is to reassure us that the banking system is sound. Therefore, we cannot expect the stress tests to give us an independent, unbiased assessment of the resilience of the banking system – and so the stress tests cannot be credible.

Flaw #14: Stress tests are unaudited

Stress tests are not audited, and cannot be. This would be less of a problem, but for the fact that the central bank has an incentive – as we have just seen – to produce results that make the banking system look good. The combination of these two factors further undermines any credibility that they might have had.

Flaw #15: Repeated stress testing becomes an increasingly irrelevant compliance exercise

Evidence from the United States – the Federal Reserve has been conducting stress tests since 2009 – indicates that repeated stress testing is producing ever more predictable results. This finding suggests that the banks have learned how to play the stress testing game in order to pass the tests with the minimum cost and inconvenience.

There is now a flourishing cottage industry by which the banks hire experts to get them through the tests. The experts involved are former Federal Reserve officials who used to conduct the tests themselves, and who are much better remunerated as poachers than they used to be as gamekeepers.

In the meantime, everyone involved is so focused on the regulatory risk metrics that they have lost sight of the risks the banks are actually taking.

Flaw #16: Stress testing creates new systemic risks that are invisible to everyone's risk management systems

Stress testing creates new systemic risks because it exposes the entire banking system to the weaknesses in the models approved by the central bank and because it promotes standardisation across the industry when systemic stability requires diversity. In doing so, stress testing creates new systemic risks that are invisible to the risk management systems of both the banks and the central bank.

Flaw #17: Regulatory stress testing has a disastrous track record elsewhere

The relentless message from stress tests overseas was that the system is sound and policymakers were often lulled into a false sense of security. Again and again, individual institutions (Fannie Mae and Freddie Mac

in the United States, Dexia Bank in Europe, etc.) and even entire national banking systems (Iceland, Ireland, Cyprus, Greece) were signed off as safe by stress tests only to collapse unexpectedly afterwards.

Even now, European regulators are still relying on their stress tests to provide false reassurance about the health of the European banking system, when it is obvious to everyone else that Eurozone banks are in an extremely precarious state.

Nor is there a *single* case where regulatory stress testing was ever proven to be of any use afterwards, i.e., by warning of an impending build-up so appropriate remedial action was then taken that allowed the banks concerned to weather the subsequent stress event. Instead, stress testing has repeatedly offered false comfort by blinding those involved to the real dangers they were facing.

The conclusion from all of these is that the Bank of England's stress tests are useless as indicators of the dangers facing the banking system, but that the practice of central bank stress testing is worse than useless because of the false risk comfort it provides. The banking system is then exposed to the danger that another major shock could bring it down again – and this danger could have been avoided. In the meantime, whatever opportunity still exists to remedy this problem is being squandered by the Bank of England's refusal to acknowledge it.

8. What to do about the stress tests?

If stress tests are worse than useless because they provide false risk comfort, then the obvious solution is to scrap the programme.

But if the stress test programme were scrapped, how would interested parties be able to assess the financial conditions of their banks? This is a good question, but a misplaced one. It is misplaced because central bank stress tests provide a misleading picture of banks' financial health. However, it is also a good question because it points us in the right direction.

The question of how to determine banks' financial health is an age-old one and the stress tests do not solve it. There is and always has been only one solution to this problem: to get the underlying accounting

numbers right, and this is the purpose of the accounting standards. Our current IFRS accounting standards are manifestly unfit for the job, however. What is needed is a root and branch reform of accounting standards but failing that, a major step in the right direction would be to require banks to prepare parallel accounts under the old UK GAAP accounting standards regime that was superseded by IFRS in 2005. This reform could be implemented by enacting the Financial Services (Regulation of Derivatives) Bill that Steve Baker proposed as a Private Member's Bill in 2011.⁸⁶

As for the stress tests, if it is decided that they must continue then a very second best suggestion would be to patch up some of their more glaring weaknesses:

- The Bank should dispense with the CET1/RWA stress test on the grounds that the RWA measure is discredited.
- The numerator should be CET1 capital not Tier 1 capital, on the grounds that the difference between the two, AT1 capital, does not meet the basic requirements to be considered as core capital: AT1 is fool's gold, not the real thing.
- The capital measure should be the minimum of market and book capital CET1 values, on Principle of Prudence grounds. This suggestion is essentially equivalent to Sir John Vickers's suggestion that the BoE report parallel market- and book-based results for its stress tests.
- The denominator should be the maximum of

⁸⁶ For more details see Kerr (2011), pp. 52-54. The text of the Bill itself – an elegant 3-pager drafted by Tim Bush – is explained on pp. 74-75.

total assets and the leverage exposure, again on Principle of Prudence grounds.

Anything that gets this particular genie even part way back into his bottle would be progress. Which point reminds us of the true nature of the stress tests: they are a form of magical thinking that purports to conjure up a strong banking system out of a weak one. To quote a famous practitioner:

Well Ali Baba had them forty thieves
 Scheherezad-ie had a thousand tales
 But master you in luck 'cause up your sleeves
 You got a brand of magic never fails
 You got some power in your corner now
 Some heavy ammunition in your camp
 You got some punch, pizzazz, yahoo and how
 See all you gotta do is rub that lamp.

Can your friends do this?
 Do your friends do that?
 Do your friends pull this out their little hat?
 Can your friends go poof?
 Well, looky here
 Can your friends go, Abracadabra, let 'er rip
 And then make the sucker disappear?
 (With apologies to Robin Williams)

I prefer however to leave the last word to the most powerful magician of them all, Mephistopheles: *Ich bin der Geist der stets verneint*. Loosely translated: You can never rely on those darn stress tests when you need them.

